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ABSTRACT

The decision making process requires more than merely gathering and having access to data. It also involves gathering the "correct" data and "interacting" with that data to realize a desired outcome. To provide students with this type of data about education and work opportunities in such a way that they can relate it to their own goals was the objective of the computer based Information System for Vocational Decisions (ISVD). However, field tests of the system were hampered by technical problems and by the misunderstanding of the objective of ISVD. The project did clearly demonstrate that it is possible to: (1) interact with an inquirer in a natural language medium, (2) interact with several inquirers simultaneously, (3) recognize and respond appropriately to individual requests, and (4) provide facts and data at various levels of specificity to suit the mode in which the user is operating. (JS)

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FINAL REPORT

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AN INFORMATION SYSTEM FOR VOCATIONAL DECISIONS

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"EVERY MAN IS THE ARCHITECT OF HIS OWN FUTURE."

Appius Claudius Caecus, Aphorism, *from Speeches to Caesar's Senate, ca. 312 B.C.*

In the future, correspondence with the ISVD should be addressed to:

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I. THE INCEPTION OF THE INFORMATION SYSTEM FOR VOCATIONAL DECISIONS

INITIATION

The United States Office of Education and the President and Fellows, Harvard College, entered into agreement as of 1 June 1966 to support and construct the prototype of a computer-based Information System for Vocational Decisions (ISVD). The prototype was to have been delivered on or before 1 July 1969, thirty-seven months from the date of initiation. (It was actually turned into the ERIC system effective 1 January 1970.)

ORGANIZATION

The Information System for Vocational Decisions (ISVD) was directed by an Executive Committee. (See section on Authority for a list of its members.) Through this particular committee, the ISVD embraced the interests which Harvard University, the New England Education Data Systems (NEEDS), and the Newton School Department had in the construction and field testing of a computer-based, guidance and counseling inquiry system.

OBJECTIVE

The major objective of the ISVD is to improve vocational decision-making through the use of a computer-based training system. The program is to be so designed that the student can relate knowledge about himself to data about education, training, and work and thereby create a body of information on which he can base his career decision. The entire program links person, computer, and teacher or counselor in such a way that the student can conduct a dialogue with the computer, while the counselor assists in interpreting and evaluating the results of the dialogue.

PROBLEM AS STIPULATED IN PROJECT PROPOSAL

The following statement is quoted in full from the original proposal entitled An Information System for Vocational Decisions, *submitted by D.V. Tiedeman, E. Landy, W.J. Fletcher, A.B. Ellis, R.G. Davis, and E.G. Boyer, Principal Investigators, to the U.S. Commissioner of Education under the provisions of Section 4(c) of the Vocational Education Act of 1963.*

"...participation in an occupation involves more than training in the specific skills required. Before, during, and even after vocational training the process of *decision-making* must also be involved. Central in decisions about occupations, jobs, or courses of study are facts/data[1] about one's self and about work. Facts illumine and frequently create decisions particularly when facts are given the status of data by inquirers. But decisions also create facts. This project therefore provides opportunity to study the interaction of facts and decision, and their subsequent creation of information.

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[1] Occupational facts/data come in two conditions, fixed and modifiable. We therefore elect to adopt the cumbersome term, 'facts/data', to indicate this fact throughout the report. Occupational facts are directly recoverable without modification except for storage and later retrieval. On the other hand, occupational data consist of facts which must be additionally processed by the numeric and/or linguistic routines of a modifying system. Either unmodified facts or previously modified data need to be further mediated if they are to be turned into information. This is why we refer conjointly to facts/data whenever our connotation is associated with information.

"The proposed ISVD will deliberately play upon a potentially useful distinction between *data* (facts) and *information* (interpreted facts). The task of the information system is to enable the individual to transform data into information. This is to be done by teaching him to interpret the data in the light of his own knowledge, experience, and intention, so that his organization and use of the data represents his own personal relationship to them in the process of decision-making. We presume that only when data are used in this way can they be described as information where the individual is concerned. The information so generated can then, in turn, serve as data in the making of future decisions.

"Given that the quality of decisions is directly related to the kind, quality, and comprehensiveness of the *information* (i.e., data in relation to personal intention) considered by the individual during the process of decision-making, then a fundamental task of guidance is to identify, evaluate, and classify needed information *and to make it readily available to counselors and students in usable forms and at needed times and places.* A second task is to learn how past decisions can be used to create information of value to the students who have made those decisions. We speak first of the provision and display of data, and its transformation into information. When we consider the teaching of decision-making, we will discuss the creation of further information by the analysis of past decisions.

"Guidance workers have had difficulty in providing and effectively displaying data. This is so because the amount of these data is directly related to the unparalleled rate of change in the technological world, which in turn is rapidly producing basic changes in our society. If we are to prepare students with skills, and attitudes and understandings for a changed and continuously changing future, we must know something of the nature of the changes involved. We must also encourage students to think of vocational planning as a *lifetime* process, not a one-time decision. 'The counselor must think *future* and not experience or he will be of diminishing value to the student of the sixties and seventies' (Wrenn, 1962, p. 20).

"Not only have counselors found it difficult to provide and display data, but the relatively infrequent contact between student and counselor has made the student's interpretation of data largely a hit-or-miss affair. Most students in secondary schools see a counselor three or four times a year at most. Furthermore, the nature of these contacts is frequently governed by a concern for the immediate next decision to be made ("What courses shall I take next term?") and the immediate interest of the student ("I'm interested in science.") The amount and quality of facts available to the counselor at the same time (and frequently without distinction) that he is attempting to get the student to use them.

"What is needed is a system which will provide for the student direct access to all relevant facts without requiring the *direct* mediation of a counselor. This would bring about a change in the counselor's role. Instead of being *both* source and interpreter of facts, he would have the primary responsibility of interpreting the student's *use* of the facts as he transforms them into information. This would require attention to the role of unconscious motivation, and the effort to help the student transform his tacit understandings into explicit ones. Also included in his role would be training the student in the use of the data system, supervising him in its use, and evaluating the student's decision-making process. Ultimately, it should be possible for the student to use the data system in a relatively independent manner for both exploration and decision-making, with recourse to the counselor only when assistance or interpretation is needed.

"Another important factor in the decision-making process is the student's *'sense of agency'*, that is, his awareness that he is an active agent in determining the course of his own career (Field, 1964). We feel that many persons, especially those in economically depressed areas who have been socially and culturally deprived, may lack this 'sense of agency' because of a lack of accurate information about themselves and their real ability[2] to act on their environment.

"This proposal is in part an outgrowth of a study conducted during 1964-65 by John B. Carroll and Allan B. Ellis under contract with the U.S. Office of Education (Contract #OE-5-10-097) (Carroll and Ellis, 1965). The study was undertaken to determine the nature of a possible data bank and the role such a bank should play in the development of a systematic education program for the New England region. A significant conclusion reached by the investigators was that an educational data bank should not be a static storehouse. To be of real value to the process of education, a data bank must be dynamic enough to become a functional part of the education process.

"This conclusion was of special interest to the New England Education Data Systems (NEEDS), which was established in 1963 by the New England School Development Council and which is affiliated with the Harvard Graduate School of Education as well as with 57 other organizations. NEEDS is an effort to bring the technology of data processing to bear on the administrative, curricular, and guidance problems of the schools of New England. A long-term objective of NEEDS is to establish a regional information center for its member school systems so that, as NEEDS grows, a large body of data will be available to facilitate educational research and development efforts in the region. This proposal is therefore designed to take a major step toward the development of such a comprehensive regional information center in the area of vocational education."

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[2] Our colleague, Norman Sprinthall, at Harvard tells us that his recent research with Ralph Mosher and John Whiteley strongly suggests that even secondary school students lack conviction that they *have* any choice in and responsibility for their educational and vocational behavior.

II. THEORY AND DESIGN

THE ROLE OF DECISION-MAKING IN INFORMATION GENERATION[1]

Primary Data Files of the ISVD

The Information System for Vocational Decisions is to be a system in which facts/data about educational, military, and vocational opportunities are turned by each of its inquirers into the information of a personally-determined career. The ISVD will contain three primary data files, one for each of these kinds of opportunities. These data files will be much like the files of abstracts created for the Educational Research Information Centers (ERIC) system which several universities are creating in the United States with initiative and support from the U.S. Office of Education.

Each of these three primary data files in the ISVD will be partitioned in several ways. One of these partitions will serve to distinguish between the stages of exploration or clarification in decision-making. The facts/data available for an educational, military, and occupational alternative will be fewer and at a more general level for the exploratory mode than for the clarificatory mode. When exploring, an inquirer will not be expected to maintain preference for an alternative. He will be expected to be forming his preference for an alternative or to return to exploration. In this phase of decision-making, the inquirer is expected to bring the perspective of doubt to a previously crystallized choice and to bear the anxiety of ignorance in the face of new facts about the chosen alternative.

A second partition of each of the primary data files will be applied *within* its exploratory and clarificatory parts. This partition will be according to the discontinuity, or socially induced choice situation in life for which the data file is pertinent. With the education data file, this partition will specialize according to choice of: 1) high school curriculum; 2) post-secondary institutions; 3) post-secondary specialty; 4) graduate institutions; and 5) graduate specialty. In the case of the military data file, the partition will be directed toward promotion within the enlisted and officer ranks of each of the three major U.S. Armed Services. In the case of the occupation data file, it will include the choices: 1) occupation; 2) placement; 3) promotion; and 4) career.

The occupation data file will have an adjunctive file incorporating forecasts by industry according to national and regional conditions. The primary purpose of facts/data on forecasting will be described shortly.

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[1] The first part of this section is based on Project Report Number 12, "The Role of Decision-Making in Information Generation: An Emerging New Potential in Guidance," by David V. Tiedeman. Richard Durstine participated extensively in editing that document for this report.

Purpose and Self Development through the ISVD

The ISVD will offer access to the three primary data files within the context of achieving purposeful activity during self development. Two pedagogical modes will be provided for this context. One mode will be teaching *about* concepts relevant to purpose in self development. The concepts included in this mode will be: 1) the psychology of becoming purposeful; 2) self and decision-making; 3) psychological attributes and educational, military, and occupational decisions; and 4) any needed instructions for use of the three primary data files.

The second pedagogical mode will be that of decision-making applied to the data both of another's life and of one's own life. The basic mode with the data of another's life will be that of a game. An inquirer will either cooperate or compete with others in playing rounds in a game context that requires time planning in relation to future possibilities and consequences. The context of time planning will be in terms of education, work, leisure, and family. Future possibilities and consequences will be retrieved in part from the forecasting data file mentioned earlier. The playing of rounds of the game will provide rudimentary simulation of career development. However, the ISVD will also let inquirers substitute their *own* data in the game structure and will then use this simulated career development structure *in personal decision-making*, that is in decision-making in which the person is himself the player and the object of the game. In personal decision-making, the basic pedagogic mode will be that of guidance in counseling. In this mode the internalization of the game structure into the personality is expected and facilitated so that the game structure can become a guiding mechanism in the future anticipatory activity of the inquirer.

Secondary Data Files and Routines in the ISVD

The substitution of one's self for the life circumstance of another will create need for two kinds of secondary files. One secondary file will be that of the individual's education and psychological characteristics. This file will be created and maintained both to permit counselors to call for cumulative records and to permit individual inquirers to generate alternative possibilities for themselves by using the predictive framework in relation to anonymous psychological characteristics, choices, and later accomplishments as based on histories of other inquirers which will be stored in this file. This technique will in the ISVD be augmented by a procedure due to Thomas Hutchinson, a doctoral candidate at the Harvard Graduate School of Education. The Hutchinson procedure will allow the inquirer to specify both the alternatives he is considering and the levels of reward which he seeks from each specified alternative. The procedure will then provide indication of whether the inquirer's psychological data are like those of others who before him chose the alternative and achieved the designated rewards.

The secondary file will store important elements of the person's decisional frameworks in working out his life plans. The file will consist of summary statements which the person generates at the conclusion of each career, arising from using the repetitively applied routines of the ISVD in relation to each discontinuity in which he addresses his future and learns from his past in the ISVD. The inquirer will of course *himself* be engaged in abstracting his life circumstance while creating these data for his life.

Inherent in the secondary file on the person's decisional framework will also be a procedure due to Terence J. O'Mahoney, a doctoral candidate at the University of Leeds. This procedure will be a paired comparison of vaguely *pictured* occupational activities presented to reveal the person's self concept in the context of occupational activity. Such paired comparison operations give an inquirer clearer linguistic understanding of himself in ideal and actual terms. The understanding will then be an *explicit* basis upon which the inquirer can deepen his knowledge of his union of personality and occupation. Use of the procedure will be available for the mode of exploration, not clarification. In short, the O'Mahoney procedure as expanded from its present context of just occupational pictures will permit decision in an education, military, occupational, or family context to aid in discovering harmonies and disharmonies in personal psychologies and activities.

FROM FACTS/DATA TO INFORMATION

Generating English in the Guiding Mechanism

As has been noted, the basic aim of the ISVD is to help an inquirer to create a language structure in harmony with his evolving vocational development. In the ISVD, the computer is to assist in the processes both of his vocational development and of its harmonization with personal career development.

The personal career development which the ISVD attempts to cultivate presumes the existence of discontinuities in the person's vocational development. A discontinuity has both external and internal referents. The external referents are those aspects of the societal structure which precipitate discontinuity of personality development by virtue of forcing choice in order not to have a prescribed set of experiences and requirements for all citizens. In the ISVD, these external referents are keyed to the educational, occupational, military, and personal and family living decisions which are available in the United States.

The internal referents of discontinuities are those aspects of ego processes which give rise to and/or support the emergence of self awareness in career development. The internal referents emphasize the continuities of personality during the meeting of a discontinuity of society. As such they tend to stress the integrative aspects of personality in career development in relation to the differentiating aspects of society in vocational development. These internal referents are thus the potentially harmonizing conditions in the linguistic differentiation of vocational development which the ISVD seeks to cultivate during career development.

The ISVD assumes that a process is discernible and explicable during any meeting of the externals and internals associated with a societally-generated discontinuity in life. The ISVD further assumes that this process is analyzable by us and eventually by the person experiencing the discontinuity into anticipatory and accommodating phases. The Tiedeman and O'Hara theory of decision-making (1963) on which this assumption is predicated further assumes that the phase of anticipation is both publicly and personally analyzable in terms of the steps of exploration, crystallization, choice and clarification and that the phase of accommodation is also publicly and personally analyzable in terms of the steps of induction, reformation, and integration.

The ISVD is planned to bring a subject's attention upon the processes of vocational development for reasons of his achieving further harmony in career development. This attention will be sought both in a machine and in a personal context. In the machine context, the person interacting with the System will be treated as if he is an inquirer, a person who is himself in search of answers for problems which he is generating and who is also willing and able to assume responsibility for the actions predicated upon such inquiries. For this reason, the machine context of the ISVD will consist on the one hand of the primary data files which have been outlined briefly in the prior section.

The inquirer's searches of primary data files will also have to be mediated by the computer in some of its aspects. This mediation is being designed in the ISVD as if we were teaching a guidance machine to understand English. This stance is necessary in the ISVD in order to keep the subject's interaction as that of inquiry. However, the stance is more importantly necessary because the "game" of the System is to facilitate the incorporation of the English which the guidance machine is able to understand into the English upon which an inquirer becomes ever more aware that he has predicated his vocational and career developments. Thus through teaching, practice, and interpersonal relations, the ISVD expects the incorporation of the English understanding of the System into linguistic structures of the person. MONITOR will be a central concept for this incorporation. MONITOR will be a System control for checking the inquirer's understanding of the linguistic framework of his vocational and career developments. MONITOR will also consist of the rules and processes which went into our creation of that control. Through this means, the ISVD expects that a person will permit himself to be guided by our control and come to life by the internal operation of his intelligence as he grows in wisdom about his career development. 'MONITOR' is our way of expressing the stage of the generalization which is taken over by the person in his machine interaction. Supervision by counselors and instructors is our way of further generalizing 'MONITOR' in order to complete its internalization and operation in everyday practice by the individual.

The teaching of the guidance machine to understand English and the incorporation of that process because of interaction with an inquirer gives rise to the machine operations which have been previously referred to as those of the secondary data files. Secondary data files must be planned to operate in two ways. One of the ways that secondary data files must operate is subsidiary to primary data files when matters of accuracy in inquiry of those files are in focal attention. The other way in which the secondary data files must operate is superordinate to the primary data files when the teaching and practice of decision-making is in focal attention. It is in this superordinate operation of the primary data files that the hard design puzzles of teaching MONITOR and 'MONITOR' to understand English actually rest.

This sketch of the ISVD is neither easy to construct nor to understand. However, we trust that we have now created enough both of a review of the prior section and of an overview of terms and later discussion so that we are justified in proceeding with more of the detail of *how* ISVD will actually be structured so that some of its aims can be realized.

Information From Facts/Data

The details of the primary and secondary data files noted in the prior section are an inherent part only of the ISVD. However, the information processes which are also inherent in the concepts of the primary and subsidiary data files have more general applicability extending to all library data processed with the help of a computer. A particularly significant library project of this nature in the United States is that of the several ERIC projects. Each ERIC center has a specific subject. The researchers in each center are responsible for assembling and abstracting published literature in their subject and for servicing requests for references in that literature. The subject of guidance and counseling is handled at the University of Michigan under direction of Professor Gary Walz. We particularly refer to Walz' contributions to the theory of information generation as we proceed to consider that theory and the ISVD.

Walz and Rich have a significant article on ERIC and its potential contribution to the practice of student personnel services. In this article, Walz and Rich (1967) first describe the processes of abstracting, indexing, and cross-referencing reduced information as we have somewhat described those processes in the preceding section. They then go on to consider both the predictable outcomes of those processes and their implications for student personnel services as well. These predictions and their implications constitute a potential possible in ERIC but not yet thoroughly implanted.

Predictable outcomes of the processes of data decomposition and article retrieval are, according to Walz and Rich: 1) synthesis and evaluation become dominant processes; 2) gaps in the information structure become evident; 3) use of impersonal resources increases; 4) opportunity for interprofessional interaction increases; 5) information, not a book, is retrieved; and 6) time to information is reduced and the band width of information is increased. The implications of data decomposition and article retrieval for pupil personnel services are: 1) the approach to learning will become that of inquiry; 2, 3, 4) the information generation process will require new skills to approach learning including stress upon the processes of evaluative integration and of information coagulation, not absorption; 5, 6) changed methods of professional communication and increased collaborative efforts will occur; and 7) small esoteric information systems will develop. Walz and Rich have thus enumerated important sets of outcomes and implications. However, their conclusion is:

> "Perhaps one of the most important conclusions to be drawn from reviewing the outcomes and implications of information systems is that they may well *not be* a significant force for change. Wherever we have used 'will', we just at well could have inserted 'can'. We are more assured that the mechanics of information systems are workable than we are that individuals can make the necessary changes in attitudes and beliefs to use them. The emergence of information systems is undeniably a force for change in counselor education. Whether it results in changes or not will depend upon the professional response to that force."
>
> (Walz and Rich, 1967, p. 284)

Thus Walz and Rich stop somewhat short of asserting that data reduction and interactive retrieval actually will have the noted consequences. We in turn claim that the Information System for Vocational Decisions brings data reduction and interactive retrieval into a condition where the Walz and Rich consequences actually *will* be realized, not just *can* be realized. The ISVD is itself an interactive data reduction and retrieval system embedded within expectation, learning, and practice of personal decision-making. Decision-making is thereby given the role of information generator in the ISVD. Facts/data are turned into information by the inquirer within the context of decision-making *when* decision-making is subject to MONITOR, a concept we next specify.

ISVD and MONITOR

As has been indicated, the basic scheme of ISVD is to have data files in which previously known facts/data are stored. The System will then guide personal interaction with the data files. Personal interaction is both to be taught and to be used in the System. Use of the System can first be as a game and then in the reality of one's own life.

MONITOR refers to the computer control functions associated with the reflexive activities required in the creation of self awareness during the decision-making practiced while choosing in using the primary data files. MONITOR will be fashioned to operate at three levels of awareness about this reflexive activity. At the rudimentary level, vocational development, vocational maturity, and agency development theories will be used within the paradigm of decision-making which has been outlined above. At this level, the System will itself be programmed just to assess the *quality* of decision-making as dictated by the concepts of the several theories. This will provide a first-order and mechanistic way of guarding against failures to exercise personal responsibility during the decision-making uses of the ISVD.

The second level of operation of MONITOR will be that of giving the inquirer access to the rules and procedures of the first-level MONITOR. Each time the inquirer enters the System to interact in relation to a discontinuity in his future he will be encouraged to summarize his experience in relation to prior discontinuities which he has considered in the System. This process, which is named that of REVIEW, will include a routine which will create a juxtaposition of current statements about past experiences with past statements about what were then expectations about future events. This process of comparing the formerly anticipated with the presently actual is one of the important processes in the ISVD. The comparisons will be processed in the ISVD by the secondary data files having to do with the generalization of decision-making into career development within the context of vocational development. This processing will require all of the procedures heuristic meaning creation which are inherent in the ERIC system, namely 1) the provision of an original product (in the ISVD this is the summary of past experience which the person first supplies), 2) the abstracting of that product (in the ISVD this is the turning of the summary into form permitting comparison), and 3) the creation both of primary and coordinate index terms and of a thesaurus of synonyms of them. In the second level of operation of MONITOR the inquirers in ISVD will first be instructed in our *System* use of this data reduction process which is inherent in the facilitation of heuristic meaning. The inquirer will also have to be given access to the actual procedures by which a primary and coordinate index and a thesaurus of synonyms operate in the ISVD computing system. He will then be permitted to use his own primary and coordinate index terms and thesaurus to process the summary data collected during REVIEW of his career development both at the moment and in past uses. This procedure will actually create the smaller esoteric information systems which Walz and Rich suggest within the conception of ERIC. However, within the ISVD these smaller esoteric information systems will be really personal and not accessible to another except upon authorization of an inquirer. In fact, the smaller esoteric information systems actually are the rudiments of the cognitive structure upon which the inquirer premises his personality in the realms of educational, military, vocational, and family decisions. ISVD will thus encourage the existence and applaud the formation of smaller esoteric information systems. These personal guidance systems constitute the compromises with totality which the individual must make while being accurate, detailed, and honest with himself in an ever-maintained effort to perfect his understanding of his actions and his experience.

ISVD and Meaning through Thought, Counseling, and Supervision

Although the substitution of this second level personal "MONITOR" information system for the original System MONITOR represents a giant step toward understanding in individuality, it does not represent the completion of the process. Completion of the process further requires the machine-*free* use of "MONITOR" in the practiced use of thought in experience and action. This condition is never fully attained; it is only ever more closely approximated. It requires generalization of two phases of "MONITOR". One is that of the language of "MONITOR" itself. MONITOR will necessarily be linguistic. As Dudley and Tiedeman indicate (1970), language can never be fully co-extensive with experience. Therefore, the inquirer must be encouraged to see "MONITOR" as but a stage in understanding his harmonization of language and experience, not the end result itself. The end is more akin to his realization of language and experience as a paradox (Tiedeman, 1967), a predicament capable of being understood and appreciated but incapable of full formal construal in co-extensive fashion.

The second part of "MONITOR" which must be generalized in reaching for a practiced ease with thought, choice, and action is the inquirer's use of the condition in a social, not just a machine, context. In short, the person must move his personal "MONITOR" from machine context to interpersonal context. The counselor who supervises the inquirer's discovery of his personal "MONITOR" within the interactive computer processes of the ISVD must be the first agent of generalization of "MONITOR" from machine to interpersonal context. The counselor must use his own interaction with the inquirer as laboratory for that generalization and focus his skill in the assessment and cultivation of creative processes upon the attainment of that generalization *itself*. The supervisor of a person at school, Armed Service, or work in turn has opportunity to be the second-line agent of generalization of "MONITOR" from machine to interpersonal context. The supervisor who actually capitalizes this opportunity must also use his own interaction with the inquirer as laboratory for the generalization but must in turn focus his skill in assessment and cultivation of creative processes on the *substance* of the inquirer's role obligations in the *particular* situation under supervision. Finally, the inquirer is himself the ultimate agent for generalization of "MONITOR" from machine to interpersonal context. He must experience the weakness of the machine MONITOR within the context of his fantasy about control over circumstance and, with practice in machine and interpersonal contexts, gain confidence in his capacity to know some *but not all of* his anticipatory guiding system and its consequences in his life space.

We trust it is clear that the Information System for Vocational Decisions with its expected ramifications into non-machine and personal collaborative activity offers potential through MONITOR, "MONITOR", counseling, and supervision of turning the reduction, retrieval, and use of facts/data into information generating function which in turn is used, understood, and appreciated. In this sense we believe that what Walz and Rich suspect only *can* happen within ERIC *will* happen within ISVD.

Despite the strength of this assertion for the information generation potential of ISVD, let no one suffer the delusion that information generalization will actually occur *universally*. The ISVD will *expect* information generation to happen. The ISVD will consistently *attempt to make* information generation occur. The ISVD will be *diagnostic* about failures of information generation to appear. However, the ISVD will *only actually accomplish* information generation with those inquirers who both catch on to its theory and themselves come to use that theory without defense toward the System's part in its origin.

GETTING A GUIDANCE MACHINE TO UNDERSTAND ENGLISH[2]

The Concept of the Guidance Machine

The first part of this section on Theory and Design gives decision-making the role of information generator in the ISVD. The Part also indicates that the capacity of decision-making in information generation will depend in the ISVD on the development of a guidance machine which can understand English. The guidance machine which understands English is in turn to become first the model and then the functioning capacity of an inquirer operating in his vocational development so that his linguistic capacity to understand himself and his career is continuously expanded.

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[2] This section is based on Project Report Number 14, "Getting a Guidance Machine to Understand English," by Allan Ellis, Margaret Pincus and Patricia Yee.

Part A of the section introduces the necessity for primary and secondary data files as these files are needed in the guidance machine which will understand English. In this Part of the section on Theory and Design we therefore continue the presentation of the System which is ISVD but do so by moving from a person who is linguistically developed in his understanding of his career development to the guidance machine which had to understand English because it helped him in his linguistic development as he engaged in his vocational and career developments.

The central purpose of the ISVD is to create an environment for deciding. The needed environment must be a reckoning environment because we want inquirers to do more than just make up their minds. We want them to figure up, measure, estimate, compare, judge, make calculated guesses, and in the end take responsibility for their decisions based in such reckonings of ours and theirs. This, of course, is what *deciding* means, but often people equate decision-making with choice-making and thereby miss the inherent notion of the process and its extension over time. What is left, usually, is the mistaken idea that a person decides by making up his mind, and thus we hear about the *moment* of decision as though it all happens at a point in time which is discrete and unbounded by thought and reflection. To make it clear that it is precisely this misconception and the resulting inflexibility we wish to challenge in ISVD, we in turn will continually project in the ISVD the understanding that the reckoning a person ultimately needs is *his*, not ours or our machine's.

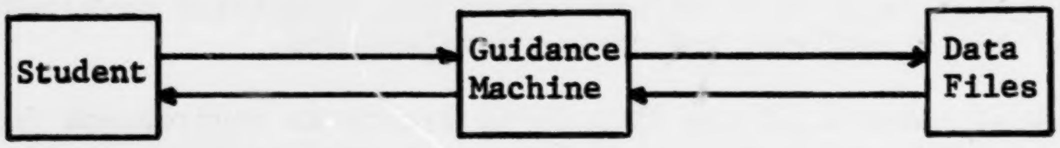
Along with the student himself there are two additional components within the ISVD reckoning environment. The first of these is an extensive collection of data about work, education, and family living. Facts about jobs, colleges, trade schools, military specialties, and about the student himself are just a few of the types of data to be stored and made available to him. These data are organized into five major data files: occupational, military, educational, personal and family living, and student characteristics. Naturally, while each of these files is separate from the other, they all reference each other so that a student may follow a question through all its aspects.

An important point which ISVD wants the student to realize about data is that in the real world they are never complete. Often it is precisely this incompleteness of data about the world of work that makes decisions necessary in the first place. Thus, before one begins the process of decision-making he must understand the incompleteness of the data with which he is dealing (Ellis and Wetherell, 1966).

The result we hope for is that by developing these skills the student will cultivate in himself a *sense of agency*, that is, the belief that he is the significant agent in determining what happens to him.

Between the student and the data we intend to place a guidance machine. The function of this third and final element of the ISVD reckoning environment is to facilitate students' access to data and vice versa. That is, not only do we wish to provide a means for the student to gain convenient access to data, but we wish to keep track of such access as well. In this way, not only can an individual get facts with which to make decisions, but he can also gain a sense of the way he goes about making decisions.

One way, then, to describe the vocational reckoning environment of ISVD is shown in this diagram:



There is, of course, no such thing as a guidance machine, and the major task of ISVD, therefore, is to build one. Instead of building this machine in the usual way with pliers and screwdriver, however, ISVD is transforming an existing computer into a guidance machine by programming its software in appropriate ways and by inserting the materials called for by that software.

Software programming and new material construction are not unnatural tasks in a computing project, since computers are made for this sort of thing. What most people call a computer program is in fact an explicit statement of a procedure, and at the same time a description of the machine needed to perform that procedure. This is a behavioral description, but it is all that a computer needs in order to imitate the machine so described. It is the purpose of ISVD, therefore, to create a sufficiently explicit description of the behavior of a guidance machine so that a computer can behave as though it were that machine.

Our efforts to create a description of a guidance machine fall into two categories. The first is the development of certain necessary software. This consists of a fairly elaborate set of computer programs which permits certain basic and generally required functions to be performed. We need, for example, to operate in a time-shared setting so that more than one student can use the system at any one time. Furthermore, we must provide the ability to create, maintain, edit, and retrieve data files. A programming language to allow both string manipulation and list processing, programs for statistical analyses, routines to permit content analysis, and the general facility of keeping track of who is on the system and what needs to be done next are some other examples of the kind of necessary computer software with which we must be concerned.

The second category of a description of a guidance machine is the ISVD software itself. These are the programs that enable our time-shared computer to behave like a guidance machine, and it is here that any substantive contributions of ISVD rest.

The single, most significant component of the ISVD software is that network of routines we call *scripts*. Not unlike the manuscript of a play (from which it gets its name) a script is a set of rules describing how the guidance machine is to act. Scripts contain such things as the text to be presented to a student via either a video display device or a printer, commands to activate a tape recorder, or motion picture projector or to display a 35mm slide, instructions for how to process the student's responses, and rules for any computation or storage or retrieval of data.

When an inquirer interacts with a guidance machine under control of our scripts, the inquirer will in turn write a *scenario*. A scenario will be the record of the inquirer's personal dialogue in the "play" which was our script. A scenario is illustrated in the last sub-section of this part.

We believe that a major feature of scripts must be the ability to allow what appears to be conversation between an individual and the guidance machine, because so much of the process of deciding consists of unstructured behavior (such as browsing through data files). Thus, the student must be free enough to generate his own questions and their scenario in as natural a form as possible. To this end we have spent some time in exploring the problem of getting a computer to seem to understand and to respond to English questions posed by the inquirer.

The Operation of a Guidance Machine

There have been a number of efforts in recent years to get computers to deal with English sentences. Among these the works of Bobrow (1963), Green (1961), Helm (1965), Simmons (1962), and Stone (1966) are especially relevant to ISVD. While we have been carefully examining the work of all these men to determine how we might benefit from them, this section is confined to but one such line of work. Specifically, we will describe our effort to adapt to our needs the computer program called ELIZA developed by Joseph Weizenbaum (1963, 1966, 1967) of the Massachusetts Institute of Technology.

While ELIZA is a computer program, it is convenient to think of it more as a scriptwriting language. This language permits an author to specify certain kinds of natural language conversations between man and machine. The ELIZA program accepts as input, scripts which describe the nature of the desired interaction. It is the job of the main program to process these scripts.

An ELIZA script is divided into two parts: a keyword section and a program section. The keyword section contains keywords and decomposition and reassembly rules. As Taylor (1967) indicates, "The keywords provide some hint as to what the student is talking about while decomposition rules provide a way to analyze his sentence to determine what he is saying." The reassembly rules describe how the program is to fashion a response to the student's input, while the program part of the script contains further details of what is to be done when there is a match between a decomposition rule and an inputted sentence.

Specifying keywords is particularly important in ELIZA and entails not only constructing a relevant set of such words but also requires a concern for their position in an input sentence. Consider, for example, one possible response to the question

WHAT WOULD YOU LIKE TO DO TODAY?

I want to play the game of baseball with you.

This sentence matches the decomposition rule:

(0(*play take use see try) 0 game 0)

(Meaning: any number of words, including no words at all, followed by one of the words in parentheses, followed by any number of words, followed by the word *game*, followed by any number of words.)

GAME is an important keyword in this script since it connotes an important part of the ISVD system. In the above example the machine has "recognized" the fact that the student would like to play a game, but it does not know which one since the word baseball was not picked up. The decomposition rule is very general and will probably match many different inputted sentences. Since this is the case, it must transfer control to a general statement which says:

WITHIN THE ISVD SYSTEM THERE ARE ONLY TWO KINDS OF GAMES THAT YOU CAN PLAY. ONE IS CALLED THE LIFE CAREER GAME AND ONE IS A RISK TAKING GAME. WHICH ONE DO YOU WANT?

Rather tactfully, it reminds the student that in order "to play" the system he must stay within its context. Now consider the following:

I want to play the life career game.

The above decomposition rule would match this input as well but the response would be inappropriate. So we must make a more specific rule:

(0(*play take use see try) 0 life career game 0)

and the transfer is directly to the game.

However, what if the student had said:

I certainly do not want to play the life career game.

This sentence would match the above decomposition rule and transfer directly to the game, which, of course, would be an inappropriate response. So we must provide another decomposition rule that would provide for the negative:

(0 not (*play take use see try) 0 life career game 0)

Obviously, then, the only way that we could be absolutely sure that the machine would understand what the inquirer is saying is to specify all the alternative decomposition rules with a particular keyword -- probably an almost impossible task! How many ways can one use the word *game* in a sentence? How many and what words could possibly precede and follow it? The best we can do is to create our decomposition rules based on a confidence level of expected student response.

Although we will always as scientists do the best we can in specifying keywords, decomposition rules and reconstitution principles, we pause here to note the particularly important fact that *it is this very impossibility for completeness in the English understanding of the guidance machine which makes the guidance machine appropriate to the theory of the ISVD.* The theory of ISVD calls for the inquirer to interact with the System until he is satisfied that he can operate with its linguistic understanding but without need for later reference to it except for the help which he can always get from its data files and his esoteric information system. Because the guidance machine will invariably have incompleteness in its keywords, decomposition rules, and reconstitution principles, inquirers will eventually find that the guidance machine cannot understand the English which they elect to use. The appearance of these times constitute teachable moments in the ISVD. The inquirer can either then go away mad and forever damn the machine because it cannot do what he expected it to do *for him* or he can then go back into the sequence he was pursuing and find out where the sequence began to fail with our keywords, decomposition rules and reconstitution principles. With MONITOR the inquirer will additionally be able to reprogram his own data file so that failures disturbing to him do not later occur. In that process, the inquirer will be learning that career is *in him* and that capability and confidence in working with career conceptions can be *his* if he but makes our language his.

Returning then to our story about the operation of a guidance machine itself, decomposition rules in an ELIZA script are listed in order of generality, the most specific listed first, and so on. The following is an example of the keyword section in our ORIENTATION script for the word 'game', specifically the rules of play:

```
(game(game(--specification of keyword

(0 how 0 (*play take use see try) 0 risk 0 game 0) () aaa

(0 how 0 (*play take use see try) 0 life career game 0) () bb

(0 rules 0 life career game 0) () bb

(0 rules 0 risk game 0) () aaa

(0 rules 0 game)  (which game are you interested in.)   0

DECOMPOSITION RULE        REASSEMBLY RULE           TRANSFER POINT TO
                                                    PROGRAM SECTION
```

Aside from keywords, decomposition and recomposition rules, ELIZA operates on several other powerful mechanisms. The first of these is called a DLIST. This function allows the scriptwriter to tag certain words as belonging to a particular category. Consider the following:

```
(MOTHER DLIST (/FAMILY))
(FATHER DLIST (/FAMILY))
```

```
(BROTHER DLIST (/FAMILY))
(SISTER DLIST (/FAMILY))
```

Mother, father, brother, and sister are all tagged family. This saves considerable time in decomposition rules. Instead of specifying a decomposition rule for each word, the scriptwriter can do the following:

```
(0 LOVE 0 (/FAMILY) 0)
```

which means: match an inputted sentence that has any number of words, followed by the word LOVE, followed by any number of words, followed by any word tagged FAMILY, followed by any number of words.

Now a reassembly rule would allow the computer to come back with an appropriate response:

```
(0 LOVE 0 (/FAMILY) 0) (WHY DO YOU LOVE YOUR 4.)
```

The 4 refers to the fourth element in the decomposition rule. In this case, the word tagged family. A conversation could go like this:

S: I love my mother.

C: WHY DO YOU LOVE YOUR MOTHER.

S: Because she's nice to me.

C: DO ANY OTHER REASONS COME TO MIND.

(This response is triggered by the word "because".)

Another important mechanism is the ability to make substitutions in the student's input and then apply decomposition rules to the revised input. For instance, some of the substitutions that we made were:

```
(OF COURSE = YES.)
(YEAH = YES.)
(NATURALLY = YES.)
(RIGHT = YES.)
```

What happens then is that any time 'of course', 'yeah', 'naturally', or 'right' occur in the input, the computer substitutes the word 'YES'. If we are looking for a YES response from the user and he types in any of the above, his input would then be treated as a YES.

A third mechanism is known as the table mechanism. This is powerful because it keeps track of the context of the conversation. It is used when there is a possibility of several different user responses, each of which refers to a previous context. For instance, a user might answer a question YES, NO, or UNSURE. In the keyword section of the script we have the following:

```
(0 YES 0 DLIST(YYY))
(0 NO 0 DLIST(NNN))
(0 (/UNSURE) 0 DLIST(ZZZ))
```

Each decomposition rule is given a tag; the first is tagged (YYY), the second (NNN), and the third (ZZZ).

In the program section following the question, is the table. *A TYPE ('DO YOU LIKE TO PLAY GAMES'.), NEWTOP ('(YYY AA NNN AB ZZZ AC O'E M), TABLE).

The instructions to the computer go as follows:

TYPE the sentence 'DO YOU LIKE TO PLAY GAMES'. If he answers 'yes' go to the label (another piece of text usually) AA; if he answers 'no' go to the label AB; if he answers a word tagged 'unsure' go to the label AC; otherwise (O'E) go to the label M. STOP, wait for input (indicated by the period following the last parenthesis).

Another important feature of ELIZA is the ability of one script to call into play another script, to switch control and to return to the main script when that level of conversation has been terminated. We made heavy use of this ability.

For a more complete description of ELIZA, refer to the work of Taylor (1967) and Hayward (1968).

Orientation, Access Routines, and a Scenario in ISVD: An Illustration of an Inquirer Interacting with Files through Orientation and Routines Programmed in ELIZA

Access Routines and the Orientation Script in ISVD

Stated simply, our first task in creating a guidance machine was to experiment with ELIZA in order to demonstrate its usefulness to the ISVD. We accomplished this task in the writing of demonstration scripts for the Access Routines of EXPLORATION and CLARIFICATION as well as for the ISVD ORIENTATION.

An access routine is a set of scripts that allow an inquirer access to various scripts, procedures, and to one or more of the System's several data files. In the ISVD, they are named EXPLORATION, CLARIFICATION, and REVIEW in an effort to use names close to the conditions in the Tiedeman-O'Hara paradigm of decision-making. The theory of access routine REVIEW was described in Part A above. EXPLORATION and CLARIFICATION are merely exemplified in this section as they operate as scripts which in turn give rise because of inquirer interaction to an inquirer's scenario.

Our scripts used in this experiment are inherently different from those developed elsewhere for the System in that they serve as calling (access) scripts or as data collection scripts. The purpose of a calling script is to ascertain what the inquirer wants to do: does he want to access the occupation data base, play the Life Career Game, developed by Sarane Boocock (1967), or think about which colleges to apply to? After the script has determined what it is that the inquirer wants, it calls in the appropriate materials.

A data collection script, on the other hand, asks for specific information from the inquirer (e.g., what factors are important to you in thinking about college choice?), then analyzes the information and stores it for later use in the System.

In the demonstration ELIZA ISVD script system, the ORIENTATION script is used as the main calling script. The keywords in this script refer to our three presently operable primary data files (occupations, military, and education), and to the Life Career Game.

In the following example the computer's output is in upper case, and the inquirer's input is in upper and lower case lettering.

WHAT WOULD YOU LIKE TO DO TODAY?

I don't know.

HAVE YOU THOUGHT ABOUT WHAT COURSES YOU ARE GOING TO TAKE NEXT YEAR?

Yes.

WOULD YOU LIKE TO EXPLORE THAT FURTHER NOW?

No.

WELL, HAVE YOU THOUGHT ABOUT WHAT YOU WOULD LIKE TO DO AFTER YOU GRADUATE FROM HIGH SCHOOL?

Yes, I want to go to college.

WOULD YOU LIKE TO TALK ABOUT COLLEGE CHOICE?

O.K.

FINE. SINCE WE KNOW THAT YOU HAVE NOT EXPLORED YOUR COLLEGE CHOICE WITH THE SYSTEM BEFORE, THE FIRST THING WE WOULD LIKE TO FIND OUT IF YOU HAVE THOUGHT ABOUT THIS CHOICE ENOUGH TO HAVE SOME ALTERNATIVES IN MIND. IF YOU DO, TYPE THE NAMES OF EACH OF THE ALTERNATIVE COLLEGES. IF NOT, TYPE IN THE WORD NO.

After an activity has been selected (in this case, college choice) control is transferred to one of the access routine's scripts.

If we think of the ISVD as a network of scripts, then the student is given a choice of three different kinds of scripts:

1) he can declare himself ignorant of vocationally relevant concepts and thereby gain access to concept teaching scripts;

2) if he realizes that future decisions affect his life (plan, style, etc.) and he wants to find out how, he can elect scripts for practice (such as the game);

3) if he wants to play the game for "real", using his own data and

applying 1 and 2, he can gain access to the decision-making access routines (EXPLORATION, CLARIFICATION, and REVIEW).

In the Tiedeman-O'Hara paradigm of decision-making, the purpose of exploration is to generate alternatives. Activity is to be planned so that alternatives are selected and so that preferences start to form. After an inquirer has explored any number of alternatives, crystallization should produce preferred alternatives and the bases on which those alternatives are favored. The purpose of the CLARIFICATION access routine is to test how strongly the individual maintains his commitment. Major activities in the routine are 1) those that determine if the bases for crystallization and choice do in fact exist and that the individual is aware of them, and 2) those activities that determine if these bases are realistically sound or too inhibitive.

The access routines must allow an inquirer to vacillate between EXPLORATION and CLARIFICATION when an alternative comes to mind, is only partially pursued, and is augmented by another alternative which in turn is only partially pursued. The repetition of these pursuits must be programmed so that they somehow give rise to a superordinate structure in which the inquirer can see crystallization and evoke the belief that he has chosen.

Since our intention was first to create a demonstration of ELIZA's capabilities we did not complete all the scripts that these access routines require. We feel satisfied, nonetheless, that the capabilities of ELIZA allow us to come close to reflecting the Tiedeman-O'Hara paradigm of decision-making.

A Scenario in ISVD Using the ELIZA Experimental Programs

The following extended example of a student's interaction with the ISVD EXPLORATION and CLARIFICATION scripts will serve to indicate the ways in which ELIZA is being applied to our problem. We provide such a lengthy example to suggest not only the capabilities of our present demonstration system but also to provide a sense of the kind of flexibility we wish to offer the student. In the scenario which follows,[3] the computer's output is once again in upper case; the inquirer's input in upper and lower case lettering.

WHAT WOULD YOU LIKE TO DO TODAY.

I want to think about colleges to apply to next year.

SINCE WE KNOW THAT YOU HAVE NOT EXPLORED YOUR COLLEGE CHOICE WITH THE SYSTEM BEFORE, THE FIRST THING WE WOULD LIKE TO FIND OUT IS IF YOU HAVE THOUGHT ABOUT THIS CHOICE ENOUGH TO HAVE SOME ALTERNATIVES IN MIND. IF

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[3] Because this demonstration was created roughly to explore technical, not substantive problems, the content or the wording of the scripts is subject to change as we proceed in implementing the intent of the grant.

YOU DO, TYPE THE NAMES OF EACH OF THE ALTERNATIVE COLLEGES. IF NOT, TYPE IN THE WORD NO.

Harvard University, Boston College, and Berkeley.

GOOD.
WHAT KINDS OF THINGS DID YOU DO IN EXPLORING COLLEGE CHOICE. DID YOU READ ANY COLLEGE CATALOGUES OR TALK WITH YOUR GUIDANCE COUNSELOR. MAKE AS COMPLETE A STATEMENT AS POSSIBLE.

I read the catalogue for Harvard and Boston College. I talked with my guidance counselor, and had a couple of interviews with the Dean at Harvard. My father went to Berkeley so that's why I'm interested in going there.

THESE ARE THE ACTIVITIES THE MACHINE HAS RECOGNIZED OR ANALYZED FROM YOUR STATEMENT. YOU HAVE DISCUSSED THE MATTER WITH MEMBERS OF THE FAMILY, SPOKEN WITH A GUIDANCE COUNSELOR, READ SOME COLLEGE CATALOGUES, SPOKEN WITH COLLEGE OFFICIALS.
HERE ARE SOME OTHER THINGS THAT MAY BE A GOOD IDEA TO DO IF YOU HAVEN'T ALREADY. YOU COULD HAVE DISCUSSED THE MATTER WITH A TEACHER. NOW THEN, LOOK AT THE LIST OF EXPLORATION ACTIVITIES THAT YOU PERFORMED OUTSIDE OF THE SYSTEM. HERE IS THE LIST OF YOUR PRESENT ALTERNATIVES.
HARVARD UNIVERSITY, BOSTON COLLEGE, AND BERKELEY. NOW TYPE IN THE ACTIVITIES THAT YOU FEEL HELPED YOU MOST IN MAKING UP YOUR MIND OR GAVE YOU SOME ALTERNATIVE COLLEGES TO THINK ABOUT. PLEASE TYPE THEM IN IN ORDER OF IMPORTANCE.

The interviews and talking with my Dad.

GOOD. BEFORE WE GO ON TO EXPLORE COLLEGE CHOICE, WHAT ARE THE FACTORS THAT YOU THINK ARE IMPORTANT IN CONSIDERING WHICH COLLEGES TO APPLY TO.

Grades, class rank.

ANYTHING ELSE.

Tuition costs, test scores.

HERE ARE SOME OF THE FACTORS THAT OTHER STUDENTS FOUND IMPORTANT (1) CURRICULUM CHOICE (2) COURSE SELECTION (HIGH SCHOOL SUBJECTS) (3) GRADES (4) CLASS RANK (5) TEST SCORES (PSAT, SAT, CEEB, ACT) (6) EXTRA-CURRICULAR ACTIVITIES (7) FUTURE VOCATIONAL PLANS (8) GOAL IN GOING TO COLLEGE (9) POST COLLEGE EDUCATION AND/OR TRAINING.
HERE IS YOUR LIST.
GRADES, CLASS RANK, TUITION COSTS, TEST SCORES. LOOK AT BOTH LISTS AND THEN TYPE IN ALL FACTORS FROM BOTH LISTS THAT YOU CONSIDER IMPORTANT IN THINKING ABOUT COLLEGE CHOICE.

High school courses, grades, class rank, test scores, tuition costs, future vocational plans.

FINE. THERE ARE SEVERAL WAYS THAT YOU CAN GO ABOUT THINKING ABOUT COLLEGE CHOICE WITHIN THE ISVD SYSTEM.

YOU CAN GO THROUGH SOME CONCEPT SCRIPTS WHICH ARE DESIGNED TO GIVE YOU SOME FACTS ON TOPICS RELEVANT TO COLLEGE CHOICE. OR YOU CAN PLAY THE LIFE CAREER GAME. USING THE DATA OF A MAKE BELIEVE STUDENT WHO IS LIKE YOU IN SOME WAYS YOU GO THROUGH THE PROCESS OF SELECTING A COLLEGE FOR HIM.
IF YOU HAVE SPECIFIC COLLEGES IN MIND, YOU CAN GET DATA ON THEM BY ACCESSING THE EDUCATION DATA FILE.
IF YOU LIKE, YOU CAN LET THE SYSTEM GUIDE YOU THROUGH A STATEMENT OF PREFERENCES TO COME UP WITH A LIST OF COLLEGES THAT MOST NEARLY MATCHES YOUR PREFERENCES. OR YOU CAN ELECT TO FIRST GO THROUGH A UNIT ON DECISION-MAKING, A UNIT THAT TRIES TO HELP YOU UNDERSTAND YOURSELF AND OTHERS IN RELATION TO MAKING DECISIONS. WHAT WOULD YOU LIKE TO DO.

Access the education data file.

YOU HAVE ACCESSED THE EDUCATION DATA FILE. FOR DEMONSTRATION PURPOSES ONLY, THE FOLLOWING SCHOOLS HAVE BEEN IMPLEMENTED. HARVARD COLLEGE (MEN), GOUCHER COLLEGE (WOMEN), BERKELEY UNIVERSITY (LARGE STATE SUPPORTED SCHOOL), BOSTON COLLEGE (RELIGIOUSLY AFFILIATED), AND CARNEGIE INSTITUTE (TECHNICAL TRAINING SCHOOL).
THE FOLLOWING VARIABLES HAVE BEEN IMPLEMENTED . . . COSTS (INCLUDING TUITION, ROOM AND BOARD, AND OTHER FEES), REQUIRED ENTRANCE EXAMS, CRITERIA USED IN SELECTING STUDENTS AND REQUIRED HIGH SCHOOL COURSES.
NOW THEN YOU CAN QUERY THIS MICRO DATA BASE IN ANY WAY THAT YOU WANT. PLEASE DO NOT USE QUESTION MARKS. IF YOU WISH TO STOP AT ANY TIME, TYPE IN THE WORD STOP.
YOU MAY BEGIN.

How much does it cost to go to Harvard.

TUITION AT HARVARD IS 2000 PER YEAR INCLUDING LAB AND HEALTH FEES. ROOM AND BOARD IS 1170 DOLLARS. NON-RESIDENT STUDENT FEE IS 25 DOLLARS. BOOKS AND SUPPLIES ABOUT 70 PER YEAR. PERSONAL EXPENSES ABOUT 375 DOLLARS INCLUDING ROOM SUPPLIES, CLOTHING, CLEANING AND LAUNDRY, RECREATION, AND OTHER PERSONAL EXPENSES (EXCEPT TRAVEL).

How does that compare with Boston College.

BOSTON COLLEGE'S TUITION IS 1600, ROOM AND BOARD IS 1050 DOLLARS. OTHER COSTS INCLUDE BOOKS AND SUPPLIES ABOUT 100 DOLLARS, LAB FEE 100 DOLLARS AND 30 DOLLARS FOR WOMEN BOARDING STUDENTS FOR HEALTH FEES.

What high school courses should I take for Boston College.

NO SPECIFIC NUMBER OF UNITS IS REQUIRED HOWEVER THE FOLLOWING MINIMUM IS REQUIRED . . . ENGLISH (4), ALGEBRA (2), PLANE GEOMETRY (1), FOREIGN LANGUAGE (2), TRIGONOMETRY (FOR STUDENTS PLANNING TO MAJOR IN MATH, BIOLOGY, CHEMISTRY OR PHYSICS) (2)FOR STUDENTS PLANNING TO MAJOR IN THE ABOVE SCIENCES AND FOR APPLICANTS TO THE SCHOOL OF NURSING), ACADEMIC ELECTIVES (5).

What specific entrance exams are required.

BOSTON COLLEGE REQUIRES THE SAT AND THREE ACHIEVEMENT TESTS. ENGLISH, LEVEL I OR II MATHEMATICS, AND ONE OF THE CANDIDATE'S CHOICE.

Does Berkeley require the SAT.

APPLICANTS WHO ARE INELIGIBLE, DUE TO GRADE AVERAGE, OR TO UNIT OR DISTRIBUTION DEFICIENCIES, OR WHO HAVE GRADUATED FROM AN UNACCREDITED SECONDARY SCHOOL, MAY QUALIFY FOR ADMISSION BY CEEB EXAMINATIONS. THE THREE ACHIEVEMENT TESTS REQUIRED FOR THOSE APPLYING FOR ADMISSION ARE . . . ENGLISH, ONE TEST IN SOCIAL STUDIES OR FOREIGN LANGUAGE, ONE TEST IN MATHEMATICS OR A SCIENCE. REQUIREMENTS FOR CALIFORNIA RESIDENTS. . . TOTAL SAT SCORE OF AT LEAST 1000, AND TOTAL SCORE ON THREE ACH OF AT LEAST 1650 WITH NO SINGLE ACH LESS THAN 500.0. REQUIREMENTS FOR OUT-OF-STATE RESIDENTS. . . TOTAL SAT SCORE OF AT LEAST 1100 AND TOTAL SCORE ON THREE ACH OF AT LEAST 1725.0.

What are the costs there.

TUITION AT BERKELEY IS 980 DOLLARS PER YEAR OF THREE QUARTERS FOR OUT-OF-STATE STUDENTS. NO TUITION FOR CALIFORNIA RESIDENTS. ROOM AND BOARD VARIES BETWEEN 600 AND 940 DOLLARS. INCIDENTAL FEE OF 242 DOLLARS. ASSOCIATED STUDENTS MEMBERSHIP FEE 11 DOLLARS. BOOKS AND SUPPLIES ABOUT 80 TO 110 DOLLARS.

How do they choose their students.

BERKELEY SELECTS ITS CANDIDATES ON THE BASIS OF A CANDIDATE'S SECONDARY SCHOOL RECORD AND CEEB SCORES. ALUMNI RELATIONSHIP AND GEOGRAPHICAL DISTRIBUTION NOT RELEVANT.

How about Harvard.

HARVARD CHOOSES ITS CANDIDATES ON THE FOLLOWING CRITERIA. SECONDARY SCHOOL RECORD, SCHOOL'S RECOMMENDATION, AND CEEB SCORES. ALSO, CHARACTER, PERSONALITY AND EXTRACURRICULAR PARTICIPATION ARE STRONGLY EMPHASIZED. SPECIAL TALENTS AND INTERESTS ALSO CONSIDERED.

How much does it cost to go to Goucher.

THERE IS A COMPREHENSIVE FEE OF 2950 DOLLARS PER YEAR INCLUDING TUITION, ROOM AND BOARD, AND LAB FEES. STUDENT ACTIVITY FEE OF 13 DOLLARS, HEALTH FEE 50 DOLLARS, AND GYMNASIUM OUTFIT 27 DOLLARS. OTHER COSTS INCLUDE BOOKS AND SUPPLIES ABOUT 100 DOLLARS.

What kinds of courses should I take.

16 UNITS REQUIRED, THE FOLLOWING RECOMMENDED . . . ENGLISH (4), MATHEMATICS (3), (2 IN ALGEBRA, 1 IN GEOMETRY), ONE FOREIGN LANGUAGE (3), HISTORY (2), LABORATORY SCIENCE (1). THE COMMITTEE ON ADMISSIONS MAY ALLOW ENTRANCE CREDIT FOR WORK IN ELECTIVE SUBJECTS NOT LISTED.

How do they pick their students.

GOUCHER COLLEGE BASES ITS CANDIDATE SELECTION ON THE SECONDARY SCHOOL RECORD, THE SCHOOL'S RECOMMENDATION, AND TEST SCORES. OTHER IMPORTANT FACTORS ARE PERSONAL CHARACTERISTICS, EXTRACURRICULAR PARTICIPATION, AND INDIVIDUAL INTERESTS. ALUMNAE RELATIONSHIPS AND GEOGRAPHICAL DISTRIBUTION CONSIDERED.

I think that I would like to stop now.

WOULD YOU LIKE A SUMMARY OF YOUR EXPLORATION OF THE EDUCATION DATA FILE.

Yes.

FINE.
YOU GOT DATA ON THE FOLLOWING VARIABLES FOR HARVARD COLLEGE. . . COSTS, INCLUDING TUITION AND ROOM AND BOARD, HOW THE SCHOOL SELECTS ITS STUDENTS.
FOR BOSTON COLLEGE YOU GOT DATA ON THE FOLLOWING VARIABLES . . . COSTS, INCLUDING TUITION AND ROOM AND BOARD, WHAT HIGH SCHOOL COURSES ARE RECOMMENDED OR REQUIRED FOR ENTRANCE, WHAT ADMISSIONS TESTS YOU SHOULD TAKE.
YOU HAVE FOUND OUT ABOUT WHAT ADMISSIONS TESTS YOU SHOULD TAKE, COSTS, INCLUDING ROOM AND BOARD, HOW THE SCHOOL SELECTS ITS STUDENTS, FOR THE UNIVERSITY OF CALIFORNIA AT BERKELEY.
FOR GOUCHER COLLEGE YOU EXPLORED THE DATA ON THE FOLLOWING VARIABLES. . . COSTS, INCLUDING TUITION AND ROOM AND BOARD, WHAT HIGH SCHOOL COURSES ARE RECOMMENDED OR REQUIRED FOR ENTRANCE, HOW THE SCHOOL SELECTS ITS STUDENTS.
YOU DIDN'T EXPLORE THE AVAILABLE DATA ON CARNEGIE INSTITUTE.
NOW THEN. WOULD YOU LIKE TO GO BACK AND FIND OUT ANYTHING MORE ABOUT THESE SCHOOLS.

No.

WOULD YOU LIKE TO GO INTO CLARIFICATION NOW.

Yes.

OF THE FOLLOWING COLLEGES THAT YOU HAVE EXPLORED, WHICH WOULD YOU CONSIDER APPLYING TO.
HARVARD UNIVERSITY, UNIVERSITY OF CALIFORNIA AT BERKELEY, BOSTON COLLEGE, GOUCHER COLLEGE.

Boston College, maybe Berkeley, and Harvard.

ARE THEY LISTED IN ORDER OF PREFERENCE, THAT IS, IS YOUR FIRST CHOICE FIRST ETC.

No.

PLEASE TYPE THEM IN ORDER OF PREFERENCE.

Harvard University, Boston College, Berkeley.

YOU HAVE DECIDED TO GO INTO CLARIFICATION CONCERNING YOUR PREFERRED ALTERNATIVE HARVARD UNIVERSITY.
YOU HAVE ACCESSED THE EDUCATION DATA BASE AND GOTTEN SOME OF THE AVAILABLE DATA ON HARVARD UNIVERSITY.
IN EXPLORATION, YOU STATED THAT YOU CONSIDERED THE FOLLOWING TO BE IMPORTANT FACTORS IN CONSIDERING COLLEGE CHOICE . . . GRADES, CLASS RANK, TEST SCORES, COURSES, GOAL.

NOW THEN, YOU SHOULD HAVE A FAIRLY GOOD IDEA OF WHERE YOU STAND IN RELATION TO THESE FACTORS AS WELL AS WHERE STUDENTS ADMITTED TO HARVARD UNIVERSITY STAND. RIGHT.

No.

WOULD YOU LIKE TO GO BACK TO EXPLORATION TO FIND OUT HOW YOU COMPARE WITH HARVARD STUDENTS.

No.

WOULD YOU LIKE TO CHOOSE ANOTHER ACTIVITY.

Sure.

WHAT WOULD YOU LIKE TO DO.

Find out about jobs.

HOW WOULD YOU LIKE TO DO THIS.

I would like to access the occupation data base.

O.K.
THIS OCCUPATION INFORMATION SCRIPT IS AN EXAMPLE OF HOW SPECIFIC INFORMATION CAN BE EXTRACTED FROM THE CIVILIAN OCCUPATION DATA BASE. FOR THIS SCRIPT, THE FOLLOWING FIVE JOBS WERE SELECTED — DOCTOR, LAWYER, BARBER, MACHINIST, AND MUSICIAN. SEVEN CATEGORIES OF INFORMATION ARE PROVIDED FOR EACH TITLE -- A DESCRIPTION OF JOB DUTIES, SALARY, BENEFICIAL HIGH SCHOOL COURSES, EDUCATIONAL REQUIREMENTS, WORKING HOURS, FUTURE DEMAND, AND PERCENTAGE OF MEN AND WOMEN IN FIELD. IF AT ANY TIME YOU WISH TO STOP, TYPE THE WORD STOP. YOU MAY NOW BEGIN.

Tell me about the work of a doctor.

DOCTORS ARE PROFESSIONALS WHO WORK IN MEDICAL SERVICES, GOVERNMENT, AND COLLEGES AND UNIVERSITIES. THEIR WORK IS SCIENTIFIC AND TECHNICAL, AND INVOLVES THEM WITH PEOPLE. ON THE JOB THEY DIAGNOSE, AND PRESCRIBE MEDICATION FOR DISEASES, TREAT INJURIES, AND DO SURGERY.

What is his salary.

A BEGINNING DOCTOR CAN EXPECT TO MAKE AT LEAST $6500 PER YEAR, AND MAY EVENTUALLY MAKE A MAXIMUM OF $70,000 PER YEAR. SINCE MANY DOCTORS ARE SELF-EMPLOYED, HE CAN SOMETIMES SET THE NUMBER OF HOURS HE WISHES TO WORK AND THEREFORE VARY HIS INCOME.

How many men are there in this profession.

70 TO 95% OF ALL DOCTORS ARE MEN.

What are his working hours.

DOCTORS OFTEN WORK NIGHTS AND WEEKENDS. DOCTORS SOMETIMES WORK OUTDOORS.

Describe his education.

A DOCTOR MUST COMPLETE PROFESSIONAL OR GRADUATE SCHOOL BEFORE ENTERING HIS OCCUPATION. HE NEEDS 4 TO 10 YEARS OF SPECIFIC TRAINING FOR HIS JOB AND THEN 6 MONTHS TO 1 YEAR OF ON-THE-JOB TRAINING BEFORE BEING CONSIDERED A FULL-FLEDGED DOCTOR.

How long do doctors live on the average.

UNFORTUNATELY THERE IS NOTHING FOR THAT SUBJECT. WOULD YOU LIKE TO KNOW THE TOPICS OF INFORMATION THAT ARE AVAILABLE FOR DOCTORS.

Yes.

FOR A DOCTOR THERE IS INFORMATION ABOUT WHAT HE DOES ON HIS JOB, HIS EDUCATION, ADVANCEMENT, APPLICABLE HIGH SCHOOL COURSES, SALARY, NECESSARY ABILITIES, PHYSICAL DEMANDS OF THE JOB, FUTURE GROWTH OF THE PROFESSION, PERCENTAGE WHO ARE MEN, HOURS, LICENSING REQUIREMENTS, AND WORKING CONDITIONS. WOULD YOU LIKE TO SEE ONE OF THESE TOPICS.

Yes.

WHAT IS IT.

What will be the need for doctors.

CURRENT INFORMATION INDICATES THAT IN THE FUTURE THERE WILL BE AN INCREASING DEMAND FOR DOCTORS.

What high school courses would it be helpful to take to become a doctor.

A HIGH SCHOOL STUDENT INTERESTED IN BECOMING A DOCTOR SHOULD CONSIDER TAKING THE FOLLOWING COURSES -- BIOLOGY, LATIN, CHEMISTRY, FOREIGN LANGUAGES, PHYSICS, AND SOCIAL STUDIES.

For a lawyer.

A HIGH SCHOOL STUDENT INTERESTED IN BECOMING A LAWYER SHOULD CONSIDER TAKING THE FOLLOWING COURSES -- BUSINESS, LATIN, ENGLISH, HISTORY, SPEECH, AND SOCIAL STUDIES.

What about his pay.

A BEGINNING LAWYER SHOULD EXPECT TO MAKE AT LEAST $5500 PER YEAR. IN ADDITION HE MAY RECEIVE HEALTH AND LIFE INSURANCE AND PAID VACATIONS. SINCE A LAWYER MAY BE SELF-EMPLOYED, HE CAN SOMETIMES SET THE NUMBER OF HOURS HE WISHES TO WORK AND THEREFORE VARY HIS INCOME.

What about a barber.

A BEGINNING BARBER SHOULD EXPECT TO MAKE AT LEAST $65 PER WEEK, AND MAY EVENTUALLY MAKE A MAXIMUM OF $200 PER WEEK. IN ADDITION HE MAY RECEIVE TIPS AND HEALTH AND LIFE INSURANCE AND PAID VACATIONS. SINCE A BARBER

MAY BE SELF-EMPLOYED, HE CAN SOMETIMES SET THE NUMBER OF HOURS HE WISHES TO WORK AND THEREFORE VARY HIS INCOME.

And a machinist.

HE MAY RECEIVE FREE ADVANCED TRAINING, OVERTIME PAY, AND HEALTH AND LIFE INSURANCE AND PAID VACATIONS. SINCE A MACHINIST MAY BE SELF-EMPLOYED, HE CAN SOMETIMES SET THE NUMBER OF HOURS HE WISHES TO WORK AND THEREFORE VARY HIS INCOME.

Describe his work.

MACHINISTS ARE MACHINE WORKERS IN THE MANUFACTURING OF METAL PRODUCTS, THE MANUFACTURING OF ELECTRICAL MACHINERY, UTILITY COMPANIES AND THE MANUFACTURING OF MACHINERY. THEIR WORK REQUIRES THEM TO DEAL WITH MACHINES AND TECHNIQUES. ON THE JOB THEY SET UP AND OPERATE MACHINE TOOLS TO MAKE OR REPAIR METAL PARTS OR PRODUCTS.

Tell me about the musician.

MUSICIANS ARE PROFESSIONALS WHO WORK IN SPECIAL SCHOOLS, DANCE HALLS AND SCHOOLS AND THEATERS, ORCHESTRAS, AND CLUBS. THEIR WORK IS ABSTRACT AND CREATIVE AND REQUIRES THEM TO DEAL WITH PEOPLE AND IDEAS RATHER THAN WITH THINGS AND OBJECTS. ON THE JOB THEY ENTERTAIN THE PUBLIC BY PLAYING IN SYMPHONY ORCHESTRAS, DANCE BANDS, OR JAZZ COMBOS.

What kind of an education does he need.

A MUSICIAN MUST COMPLETE JUNIOR HIGH SCHOOL AND SHOULD ALSO GRADUATE FROM COLLEGE BEFORE ENTERING HIS OCCUPATION. HE NEEDS 4 TO 10 YEARS OF SPECIFIC TRAINING FOR HIS JOB BEFORE BEING CONSIDERED A FULL-FLEDGED MUSICIAN.

Stop.

WOULD YOU LIKE A SUMMARY OF YOUR EXPLORATION OF THE OCCUPATION DATA BASE.

No.

DO YOU WANT TO GO INTO CLARIFICATION.

No.

WHAT WOULD YOU LIKE TO DO.

I would like to access the military data file.

IN THE ISVD MILITARY DATA FILE YOU MAY SEE SPECIFIC INFORMATION FOR THE ARMY, NAVY, AIR FORCE AND GENERAL INFORMATION FOR OFFICERS AND ENLISTED MEN. YOU MAY USE THE MILITARY SELECTION SCRIPT AND LET THE COMPUTER SORT OUT JOBS WHICH MAY BE OF INTEREST TO YOU, OR YOU MAY REQUEST DESCRIPTIONS FOR SPECIFIC MILITARY JOBS. WHAT DO YOU WISH TO DO.

Take the job selection script.

THE NAVY, ARMY, AND AIR FORCE EACH HAVE HUNDREDS OF SPECIALIZED JOBS. IN ORDER TO SIMPLIFY CLASSIFICATION, THESE HAVE BEEN CATEGORIZED BY FUNCTION ACCORDING TO CAREER FIELDS. THE INFORMATION PRESENTED HERE FOR EACH CAREER FIELD COVERS THE VARIOUS SPECIALIZED POSITIONS INCLUDED WITHIN IT. ALTHOUGH NOT ALL OF THE GENERAL INFORMATION GIVEN WILL APPLY FOR EACH SPECIALTY, YOU WILL RECEIVE AN OVERVIEW OF THE CAREER FIELD. TO DETERMINE WHICH CAREER FIELDS ARE BEST SUITED TO YOU, IT WILL HELP FOR YOU TO ANSWER THE FOLLOWING QUESTIONS. ARMED FORCES JOBS ARE PERFORMED IN MANY LOCATIONS. INDICATE WHERE YOU WOULD PREFER TO WORK BY SELECTING ONE OR MORE OF THE CHOICES FROM THE FOLLOWING LIST.

1. ON LAND
2. AT SEA
3. IN THE AIR
4. INDOORS
5. OUTDOORS

[Note: For this demonstration, only the first question of the military job selection script is shown. After the inquirer has finished with this segment of activities, he will be queried as to whether he wishes to continue with the Military Data Base.]

ARE YOU INTERESTED IN SEEING OTHER THINGS IN THE MILITARY DATA FILE.

Yes.

AND WHAT WOULD YOU LIKE TO DO NEXT.

What is there to do.

YOU MAY LOOK AT JOB DESCRIPTIONS OR REQUEST SPECIFIC INFORMATION FOR THE ARMY, NAVY, AIR FORCE, OFFICERS AND ENLISTED MEN.

Let me see information about the Army.

WHAT DO YOU WISH TO EXPLORE IN THE ARMY DATA FILE.

What about pay.

HERE IS THE PAY SCALE FOR ENLISTED MEN. ENLISTEES QUALIFY FOR PAY GRADES E-1 THROUGH E-9.

MINIMUM TIME IN GRADE FOR ADVANCEMENT		GRADE	MINIMUM MONTHLY PAY	MAXIMUM MONTHLY PAY
E-1 TO E-2	4 MONTHS	E-1	$ 90.60	$129.00 A MONTH AFTER 2 YRS. TOTAL SERVICE
E-2 TO E-3	6 MONTHS	E-2	100.50	141.00 A MONTH AFTER 2 YRS. TOTAL SERVICE
E-3 TO E-4	6 MONTHS	E-3	121.80	193.80 A MONTH AFTER 4 YRS. TOTAL SERVICE

MINIMUM TIME IN GRADE FOR ADVANCEMENT	GRADE	MINIMUM MONTHLY PAY	MAXIMUM MONTHLY PAY
E-4 TO E-5 1 YEAR	E-4	$168.60	$252.60 A MONTH AFTER 6 YRS. TOTAL SERVICE
E-5 TO E-6 2 YEARS	E-5	200.40	328.80 A MONTH AFTER 14 YRS. TOTAL SERVICE
E-6 TO E-7 3 YEARS	E-6	232.20	387.60 A MONTH AFTER 18 YRS. TOTAL SERVICE
E-7 TO E-8 3 YEARS	E-7	269.40	528.60 A MONTH AFTER 30 YRS. TOTAL SERVICE
E-8 TO E-9 2 YEARS	E-8	428.40	587.10 A MONTH AFTER 26 YRS. TOTAL SERVICE
	E-9	510.60	657.30 A MONTH AFTER 26 YRS. TOTAL SERVICE

HERE IS THE PAY SCALE FOR COMMISSIONED OFFICERS.

RANK: AIR FORCE AND ARMY	NAVY	MONTHLY PAY: NORMAL MINIMUM	MONTHLY PAY: NORMAL MAXIMUM
SECOND LIEUTENANT	ENSIGN	$ 303.90	$ 336.30
FIRST LIEUTENANT	LIEUTENANT JR. GRADE	420.30	504.60
CAPTAIN	LIEUTENANT	583.20	633.30
MAJOR	LT. COMMANDER	700.50	807.30
LT. COLONEL	COMMANDER	930.60	992.40
COLONEL	CAPTAIN	1121.40	1216.50
BRIGADIER GENERAL	REAR ADMIRAL (LOWER HALF)	1295.10	1384.80
MAJOR GENERAL	REAR ADMIRAL (UPPER HALF)	1530.60	1592.40
LT. GENERAL	VICE ADMIRAL	1648.20	1766.10
GENERAL	ADMIRAL	1883.70	2002.60

IS THERE ANOTHER SUBJECT IN THE ARMY DATA FILE THAT YOU WOULD LIKE TO SEE.

What topics are left.

THERE ARE 9 GENERAL CATEGORIES IN THE ARMY DATA FILE -- PAY AND BENEFITS, EDUCATION AND TRAINING, SPECIAL UNITS, WOMEN IN THE ARMY, PROMOTION, ENLISTMENT REQUIREMENTS, THE RESERVE PROGRAM, AND OFFICER STATUS FOR ENLISTED MEN. IF YOU ARE INTERESTED IN FINDING OUT WHAT ARMY OR MILITARY JOBS MAY BE SUITABLE FOR YOU REQUEST THE JOB SELECTION SCRIPT. WHAT TOPIC OR SUBJECT WOULD YOU LIKE TO INVESTIGATE.

What about officers.

AN ARMY MAN CAN ACHIEVE COMMISSIONED OFFICER STATUS BY ENROLLING AT A CIVILIAN COLLEGE OR UNIVERSITY FOR A BACHELOR'S DEGREE OR BY APPOINTMENT TO THE U.S. MILITARY ACADEMY OR OFFICER CANDIDATE SCHOOL. UPON COMPLETION OF ANY OF THESE PROGRAMS, HE IS COMMISSIONED AS A RESERVE SECOND LIEUTENANT.
WHAT ELSE INTERESTS YOU.

I don't want to continue.

ARE YOU INTERESTED IN SEEING OTHER THINGS IN THE MILITARY DATA FILE.

No.

HERE ARE THE ACTIVITIES THAT MAY BE OF INTEREST TO YOU. YOU CAN LEARN ABOUT YOURSELF BY STUDYING HOW YOU MAKE DECISIONS. YOU CAN PLAY GAMES WHICH GIVE YOU PRACTICE IN PLANNING EDUCATIONAL AND VOCATIONAL ACTIVITIES. YOU MAY ALSO WORK WITH THE EDUCATION AND OCCUPATION DATA FILES. DO YOU WISH TO LOOK AT DECISION-MAKING SCRIPT, PLAY A GAME, OR WORK WITH THE EDUCATION OR OCCUPATION DATA FILES.

Play a game.

IN THE ISVD THERE ARE TWO KINDS OF GAMES YOU CAN PLAY. ONE GIVES YOU PRACTICE IN TAKING RISKS. THE OTHER GIVES YOU PRACTICE IN PLANNING EDUCATIONAL AND VOCATIONAL ACTIVITIES. WHICH KIND OF GAME WOULD YOU LIKE TO PLAY.

The second kind.

THE LIFE CAREER GAME IS DESIGNED TO GIVE YOU PRACTICE IN FORMING YOUR EDUCATIONAL AND VOCATIONAL PLANS. SINCE YOU HAVE NEVER PLAYED THE GAME WITH THE SYSTEM BEFORE, IT MIGHT BE WISE TO GO THROUGH A GENERAL ORIENTATION. DO YOU WANT TO DO THIS.

Why not.

THINK HARD NOW. WHAT WAS THE FIRST GAME YOU EVER PLAYED.

Tag.

DO YOU REMEMBER HOW MUCH YOU LIKED IT.

Yeah.

WHY DID YOU ENJOY PLAYING TAG.

It was a blast.

AS CHILDREN WE LIKE TO PLAY GAMES SUCH AS TAG, MARBLES, HOP-SCOTCH, TIC-TAC-TOE, AND HIDE N GO SEEK BECAUSE THEY ARE FUN. THESE GAMES ALLOW US TO COMPETE WITH OTHER KIDS TO TRY AND WIN. BUT WE CAN'T SAY THAT THEY

REALLY TEACH US ANYTHING THAT IS DIRECTLY APPLICABLE TO EVENTS IN REAL LIFE. SOME GAMES IN ADDITION TO BEING FUN, TEACH US SOMETHING ABOUT REAL LIFE ACTIVITIES. HAVE YOU EVER PLAYED A GAME THAT SEEMED TO BE TEACHING YOU SOMETHING ABOUT WHAT GOES ON IN REAL LIFE.

Of course.

WELL, GAMES LIKE MONOPOLY, BIG BUSINESS, AND RISK DO TEACH US ABOUT THINGS IN REAL LIFE (LIKE BUYING AND SELLING REAL ESTATE, ETC.). WE CALL SUCH GAMES SIMULATIONS.
THE LIFE CAREER GAME IS SUCH A SIMULATION. WHAT YOU CAN LEARN FROM THIS GAME IS THE KIND OF PLANNING THAT INVOLVES MAKING DECISIONS ABOUT THINGS THAT ARE HAPPENING NOW AT THE SAME TIME YOU ARE THINKING AHEAD TO WHAT YOU MIGHT WANT IN THE FUTURE. WHAT KINDS OF DECISIONS ARE YOU THINKING ABOUT NOW THAT WILL HAVE AN EFFECT ON YOUR FUTURE.

I do not wish to continue.

ARE YOU INTERESTED IN DOING SOMETHING ELSE.

No, I would like to stop.

YOU HAVE JUST EXITED FROM THE SYSTEM. GOODBYE.

DATA FILES FOR COMPUTERIZED VOCATIONAL GUIDANCE: REQUIREMENTS, PREPARATION, USE[4]

The Concept of Data Files

The first part of this section on Theory and Design laid out the role which decision-making will be given as information generator in ISVD. Through ISVD, inquirers will be helped to bring their vocational and career developments to an integrated condition of sub-vocalization. The ISVD will bring the linguistic structure of a person's career development ever further to the fore of his attention. The guidance machine which understands English is the prime mechanism for this goal. A guidance machine which can be taught to understand English has been described in the second part of this section.

The guidance machine which understands English will have the capacity through access routines either of responding to direct inquiry or of sending the inquirer to any one of the numerous data files which will be available through command of the programs of the guidance machine. The conception of data files is one which has had to be developed specifically for the guidance machine which lurks in the Information System for Vocational Decisions. This activity has demanded much of the time and resource of the project. Hence we describe the specific theory of data files at this time since that theory underlies many of the activities which are reported in the next section.

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[4] This part is based on Project Report Number 15, "Datafiles for Computerized Vocational Guidance: Requirements, Preparation, Use," by Richard M. Durstine.

The project has since its beginning embodied the concept of large, orderly collections of factual information as an important part of its resources. This has led to the acquisition of several such collections of information (data files). It has also led to some general understandings about collection, storage, processing, and use of information for computerized guidance. These have now been developed and tested to the extent that a unified discussion of them is possible.

We present and explain in this part the approach to computer-managed information that has thus been arrived at, treating theory and related action, both past and planned.

Throughout we seek consistency with related theory and activities of the ISVD. Innocence of guidance and of computer technology may cause some errors in these areas, though we hope not to the extent of invalidating the major points of the theory of data files. These major points are:

1) Data should be collected and presented specifically to aid students in their vocational decisions.
2) Data should be treated in a form that exploits high speed computation. It hence needs to be systematic and highly structured.
3) The power and flexibility of operation thus gained is worth the price of rigidity of structure.
4) For the present, accuracy is of importance secondary to that of operational design.
5) Ready-made sources of information should be relied upon as far as possible. Direct collection of information is costly.
6) It is important (and possible) to articulate data from distinct and diverse sources into a working whole.
7) A primitive form of mediation between "facts/data" and "information" should be included with the data files.
8) Data files and means of access to them should be prepared separate from one another so they can be used in a variety of combinations.
9) The information given by the system should be suggestive, not prescriptive. It is the inquirer's responsibility to know and make use of this fact.

Some more specific criteria and general rules for their implementation will be found at the end of this part. The intervening discussion supports and elaborates on these general statements, drawing support mainly from the experience of preparing data files of occupational and military information for the ISVD.

The Fundamental Task in Preparation of Data Files

The intended role of factual information in the ISVD implies two special requirements:

1) It should be collected, analyzed, and presented specifically to aid a student ("inquirer") in his vocational decisions;
2) It should be treated in a form that exploits the resources of high speed computation. It needs hence to be systematic and highly structured.

Each of these points is perhaps more significant than it looks.

Much factual information of possible value in personal decisions, particularly occupational decisions, is not generally found in useful form. It tends to be better suited for economists, planners, and employees. It needs special interpretation for profitable use by individuals. The psychology of occupations as it has developed is a step in this direction. Also needed is modification of highly detailed information to a form that serves the individual. This is the direction of the work described here.

Second, the need to deal with very large quantities of information concurrently, in many combinations and for many purposes, imposes strict requirements on treatment of that information. Also, a working vocational information system should accept with minimum disruption changes or additions to the information it treats or uses. Both these needs lead to involvement of the computer and demand a highly structured system. This degree of structure is the price of size and flexibility. We conjecture that the benefit is often worth that price. It is certainly a possibility worth exploring.

The structure thus imposed on factual information within the ISVD has led to the objection that the result may be "too mechanical". But this is functional and necessary to the approach we are taking. To cover it up would be troublesome and misleading. To eliminate it would for a long time to come be inefficient and costly. To be openly mechanical in this is a simple matter of honesty. A computerized information system that pretends to be fully human has no more self-evident merit than an airplane with flapping wings or a telephone with moveable lips at the earpiece.

A Data File and How It Grew

The development of data files within the ISVD began with preparation and use of the project's first data file in the academic year 1966-67. A brief description of this file will motivate some of the conclusions that have been subsequently reached concerning data files in general.

The first data file will be referred to here as the "850 Titles File". It contains information under fifty-six categories about some 850 occupational titles. The categories are shown in Appendix I of Project Report Number 15. This title-category structure is a useful -- and obvious -- one for data files in general. To render this concept explicit, an illustrative "mini-data file" is shown in Figure 1. [p. 35]

This tiny illustrative file gives a brief verbal description of the activities of workers in each of two occupations. In addition, in coded form:

1) *Dictionary of Occupational Titles* (D.O.T.) number of the occupation;
2) Working conditions (first two columns under "Coded Data");
3) Education required (third column under "Coded Data");
4) Seasonality of work (fourth column under "Coded Data").

FIGURE 1

Illustrative Short Data File Based
on Occupational Titles

Title	*D.O.T. Number*	*Coded Data*	*Descriptive Information*
Forest Engineer	005.187	45 O 5 1	Designs and Oversees Construction of Facilities for Logging
Egg Breaker	521.887	4 I 2 9	Separates Eggs for Use in Food Products

For example, the code "45" indicates that a forest engineer must use his hands, and be able to speak and hear to do his work. An egg breaker, on the other hand, also works with his hands, but need not speak or hear. This information is contained in the position and identity of the letters and numbers in the file. Hence great care is required in designing the data file to transmit precisely the intended meaning.

The illustrative data file also tells that a forest engineer works out of doors (an "O" in an assigned position of the file carries this information), while an egg breaker works indoors (indicated by an "I" in like position). Likewise a "5" and a "2", appropriately placed indicate the levels of general education required for each (some college for the forest engineer, and some high school for the egg breaker). Finally, in the last column of code, a "1" indicates some seasonality in the engineer's work. "9" shows no information on this for the egg breaker.

This illustrative file exhibits all the characteristics and uses associated with any data file of this form. Though the 850 Titles File requires sixteen punched cards for the coded and other information about each title, it and the illustrative file are identical in their essential characteristics.

The mechanics of construction of a data file in this form are simple but strict. The way in which each piece of information is to be expressed must be unambiguously fixed. Words, numbers, or code may be used. In each case, exact meaning must be decided upon and stated. Words have the most flexibility, of course, and codes the least. However, codes are in turn most economical of space. Since the structure of the data file is highly rigid, changes or deletions can be made readily. Likewise, additions of titles or of categories are conceptually simple and mechanically straightforward. This flexibility of modification is one advantage bought with rigidity of form. This is of great value for any data file that can be expected to change in time.

Another point, perhaps less obvious and surely more controversial, is that accuracy of information is of secondary importance for the time being. It is not unimportant, but it is presently less important in the provision of a prototype than are structure and the means to use the file. For this reason, though a diligent attempt was made at accuracy in preparation of the 850 Titles File, no great effort is presently given to its modification and up-dating. (This is a mechanical task, of less immediate interest than learning to use the file in an imaginative and flexible way.)

Preparation of a large data file of factual information reveals the dependence of such files on large blocks of information prepared for other purposes. The work of agencies such as the Bureau of Employment Security and the Bureau of Labor Statistics is invaluable because many of their results can be taken readily and inexpensively into the file. This suggests three further criteria of data file preparation.

1) Direct preparation of information in large quantitites is costly, so that ready-made information sources should be relied upon as far as possible. Some information will eventually have to be gathered and prepared explicitly for the working ISVD, but this must be selected with great care in terms of its costs and its usefulness.
2) Since ready-made information will seldom exactly suit the purposes it is to serve (unless they are the purposes for which it was explicitly prepared), it must be modified to a form as appropriate to the new use as possible.
3) The need to use as many information sources as possible makes necessary the ability to articulate diverse sources or collections of information into a working whole.

The above three requirements arise directly from the need to make maximum use of available resources. This need might be classed by some as regrettable. It is, however, so universal and unavoidable that it is merely one more fact in preparing information for use by the ISVD. The problem, then, is to handle information in a way that will best serve the uses of the system, given existing technological and economic limitations. In the following pages some steps toward a working solution will be presented.

Clearly the comments here are not limited to information about occupations, though they are derived therefrom and are hence particularly suited to that application. Any data that can be readily described in terms of titles and categories can be treated in this way. Thus these comments have considerable generality. The extent of this applicability must be judged in each individual case, of course.

Further issues of collection and storage of information will be discussed later. First, however, it will be helpful to review some theoretical characteristics of the ISVD as they relate to the preparation of data files.

Role of Data Files in the ISVD

As indicated in the first part of this section "primary data files" have a central role in the operational definition of the ISVD working system. These primary data files are the data files referred to in the present part, of which the file of occupational titles described above is an example. The centrality of these data files within the ISVD thus requires their careful articulation with the system as a whole. The considerations that thus arise are of five kinds.

First, the data files (the "primary data files" of the first part) will function in the System together with some form of mediation (the secondary data files and MONITOR of the first part) to help convert the "facts/data" of the files to "information" by individual inquirers in the System. A major task of the System is to provide such mediation. Although the preparation of data files thus does not require the preparation of such mediating elements, the process of mediation will be helped if the data files are properly designed, and if some primitive form of mediation is provided with them. This both justifies and motivates the first steps that were taken toward use of the data files described above. These were:

1) Presentation of the contained information in English language form;
2) Provision for selection of information in terms of certain of its more important characteristics.

These two steps toward conversion of "facts/data" to "information" will be elaborated later.

Second, the process of decision-making by the individual inquirer is conceived in the design of the System as taking place at a number of discrete discontinuities. A central principle of the ISVD is that the inquirer should be helped to maximize his awareness of and participation in these discontinuities. The data files in use at any time will be identified in part by the discontinuity the inquirer is dealing with. As the System becomes adept at dealing with a variety of discontinuities, the structure and use of the data files to serve this end must be more and more highly refined. Thus the data files must remain flexible to varying demands depending on which discontinuity is being served. This is further reason why the highly structured form chosen for the occupational data file is appropriate to economical satisfaction of the demands of the System. It permits a single data file to serve a variety of discontinuities.

Third, the theory behind the ISVD prescribes that the inquirer be encouraged and taught to deal with his discontinuities in terms of a paradigm of several sequential stages. Again the data files will be called upon to perform differently depending on which of these stages the inquirer is in. Since at any moment each inquirer is likely to be dealing with a different discontinuity and to be at a different stage of the paradigm, great flexibility is demanded of the data files. The structure of data files thus far provided is a step in meeting these needs.

Fourth, the capacity of the inquirer to absorb and use information should have some influence on which information is provided to him, and how. The same information might be presented in a number of ways, depending on the needs and capabilities of the inquirer. If the data file itself and the means of getting at it are separate (i.e., if more than one means of access and presentation can be adjoined to a single data file) flexibility in use of a single data file will be increased.

Fifth and finally, several means for mediation of "facts/data" to "information" will be used by the System. These include direct teaching of concepts, simulation, and real experience with decision-making. The data files should stand ready to serve these various pedagogical modes. This reinforces the requirements of flexibility, and of access to the files separate and distinct from the files themselves.

A Young Data File's First Steps

It is clear, then, that the concept of the ISVD and of the operation of data files within it are both highly ambitious. Considerable time will be needed to bring them to fruition. It is hardly possible to conceive of there ever being a final system, but rather only of a working and evolving system. It is important to distinguish dreams from foreseeable accomplishments, and both from present achievements. The latter are important in that they help to confirm and give hope to the dreams. They also point the way to activities needed to bring foreseeable accomplishments to reality. It is thus desirable to consider applications of the 850 Titles File as it has developed, not as a final working thing, but as a first step, and as a suggestion of best directions for future development.

It will be recalled that the 850 Titles File consists of some 850 titles with information in fifty-six categories (prepared for computer use by placing the data for each title on sixteen punched cards; transferred subsequently to magnetic tape). It will also be recalled that this information is almost entirely in compact coded form of little direct use to an inquirer of the ISVD.

An obvious question in converting this data file to use by inquirers is how to present its contents in a form suitable for human comprehension. The answer chosen is fairly simple. As has been noted in the second part the mechanical problem of presentation of coded information is that of converting it to English or some other readable form. A second problem is that of choosing and interpreting information in a way that is maximally meaningful and minimally misleading. The mechanical problem is simpler, and will be discussed first and more fully.

The form adopted for presentation of information from the 850 Titles File can be readily described in terms of the mini-data file presented earlier. For each of two occupational titles, this file contains a brief description of the occupation plus certain coded information. For the moment it is not important whether this information is either appropriate or accurate. The mini-data file can answer questions such as "What does an egg breaker do?" "How much education does a forest engineer need?" "Where does an egg breaker work?" Answering such questions requires three steps:

1) Identify which category(ies) of stored information contains the answer to the stated question.
2) Find the appropriate information by title and category.
3) Present answer in terms understandable to the inquirer.

The first two of the above steps are technical ones, to be taken through accurate information and location of the stored information. The last can be made by constructing a suitable sentence. An example will suffice. To answer "Where does an egg breaker work?", the System must first identify where information of this type is kept, if it is kept at all. In the illustrative mini-data file, this is the third column of code, in which an "I" or an "O" is found. From this it is possible to respond, "An egg breaker works indoors."

More generally, it can be said: "A (Title) works (x)." This answers the question "Where does a (Title) work?" The System will place "indoors" in the sentence if the data file contains an "I" in the appropriate location, and with "outdoors" if there is an "O". If there are further possible situations such as "both", such a code must be defined, and words provided to interpret that code in the sentence. A special case is the possibility of a blank, or of an illegal answer, in which case some sort of null response would be called for.

The above procedure can be applied with considerable generality, given three things:

1) A skeleton sentence (e.g., "A (Title) works (x).") which makes sense for each possible insertion of (Title) and (x).
2) An English interpretation of the content of the data file for each possible content. This specifies "x" in the above sentence.
3) A substitute message if the coded information is unavailable or inappropriate.

Satisfaction of the above requirements calls for some precision and care, but is by no means impossible or even particularly difficult. Once the rules are set, new titles can be added -- or information added, deleted, or changed in the file. Likewise, the form of presentation can be altered without changing the coded information. Thus to a great extent the content and use of the data file can be separated, with resultant valuable flexibility.

It is now a direct step to answering the request, "Tell me about the occupation egg breaker" or, "Tell me about the occupation forest engineer." In either case the answer would be built of the various sentences that answer individual questions about the named occupation. The result will of course seem somewhat mechanical, but with care in preparation it should not be unbearably so. Descriptions for the 850 Titles File have been prepared in this form.

The second question, that of choice and interpretation of information, must be resolved over a longer term, and is much more difficult to handle adequately and honestly. That approach taken so far has been to use whatever data are available, and to be forthright about what they do and do not say. The flexibility designed into the data file and into the presentation of its contents will then facilitate exploitation of improvements in quality of information as they become available.

The structure of the 850 Titles File, its contents, and the presentation of its information in the form described above, have been described in detail in working documents of the ISVD project. Further elaboration of these topics will not be given in this part. The question of access to the information in this file will similarly be treated in a brief manner.

Questions about any individual job readily come to mind, and can be listed more or less briefly, particularly given knowledge of the limited scope of information on each title. The choice of occupation(s) to ask about is far less obvious. To simply present a list of 850 titles and say "You may ask about any of these," would be folly. Such a list in its entirety is of little use. Some method of selective access is needed.

The most direct way of making this choice is in terms of selected characteristics of the titles in the data file. Again we resort to the mini-data file for illustration. The inquirer might ask "Which occupations involve indoor work and require less than a high school education?" The answer would be, "egg breaker." Let us examine this procedure and its limitations.

1) Response to the question can only be in terms of the occupational titles on the list, which is a limitation of the occupational titles approach. One way of relaxing this limitation will be dealt with presently.
2) Second is the matter of which questions the inquirer can ask the data file. At the present stage of use of the 850 Titles File, questioning is in terms of responses to a set of multiple choice questions. In a fully free situation, he might make other requests, to which the data file could not respond. In that case a "don't know" or "unfortunately an answer on this subject is not available" message would have to be prepared.
3) A third eventuality is exhaustion of the file. With the mini-data file, there are, for example, no outdoor jobs that require less than a high school diploma. With a suitable message, this ceases to be a problem.

Search of the file by the computer for suitable titles is a straightforward matter, subject to the limitations mentioned above, and will see realization in the first working prototype of the ISVD.

It is important to remember that the attitude in presentation of data by the System is not prescriptive, but suggestive. The inquirer is not told that he must pursue life as an egg breaker, or even that this is desirable. He is merely informed of this alternative, and that it meets his apparent occupational specifications. A description of the occupation, prepared by the System as described above, tells him other facts about egg breakers (or forest engineers, or whatever), and gives him references to further information. He is then free to try out other sets of specifications, or to accept or reject further consideration of any title, either before or after he has received a description of it.

It is important for the inquirer to realize that the System tells what it is asked, and that it can tell no more than it knows. It is his responsibility to understand and made use of this fact. If handled properly, a system with incomplete information can be of use to the inquirer. This understanding is imperative, because full information will never be possible. A large and growing body of information will be a reality, however, and can be made responsive to the inquirer's needs, if he knows how to deal with it properly.

Extension to Other Data Files

Design for an evolving structure of data files within the ISVD can be based on experience with the 850 Titles File. First, however, a final dimension must be added to the problem namely the possibility of a complex data file composed of two or more files of the type already described.

This extension will be introduced by an example from the actual development of data files for the ISVD. The initial collection of information was made in terms of the 850 Titles File. Information from a variety of sources was coded into a highly structured framework as already described. At subsequent times other information also became available, including:

1) The supplementary volume of the *Dictionary of Occupational Titles* (D.O.T.);
2) Classification by Anne Roe's categories and levels of some 800 occupational titles;
3) Forecasts of demand to 1975 by occupation and industry of some 160 occupational groups and some 120 industrial groups.

The availability of this new information posed an important problem in information handling. In each new case the titles covered were substantially different from one another and from those in the originally prepared 850 Titles File. In the case of the supplement to the D.O.T., virtually all jobs of the earlier data file were included, so the additional information could be adjoined readily to the 850 Titles File. Waste arises from the fact that this leaves more than 90 per cent of the new information unused.

The information about Roe categories and levels (item 2 above) covers about the same number of titles as the original data file. The two lists are far from being equivalent, however. The bulk of the new information can be put to use by including it where appropriate, and leaving Roe category unspecified elsewhere.

In the case of the forecast information (item 3 above), the situation is considerably different. This information is given not by occupational title, but by occupational group. The titles used for groups of occupations and of industries exhaust all possibilities, referring sometimes to titles as "not elsewhere classified." Whereas there exist occupations that are not found in the D.O.T., there are in principal none that do not fall into one of this smaller set of occupational groups. The two classification systems are thus qualitatively different, and must clearly be treated separately.

Information by occupational title and information by occupational group can be articulated by treating one as an example of the other. Thus an example within the group "structural metal workers" is "pneumatic riveter," which is a specific title in the 850 Titles File. Likewise "pneumatic riveter" can be identified as a member of the group "structural metal workers," and through that identification other example titles can be found. Thus the disparity between the two lists is turned to good use. It adds flexibility to the search for titles of interest.

The above example can be summarized in general terms as follows:

1) A data file might very well consist of two or more pieces (title-category blocks) that have distinctly different titles and categories of information included in them.
2) Translation between these can be facilitated by suggesting the titles of each block that correspond to each title of the other. These translations need [illegible] be unique in either direction.
3) Free use and flexibility of the data files can and should be encouraged by making these translations suggestive rather than prescriptive.

A second case of articulation of the sort described above has been carried out between the occupational data file and the military data file. The latter lists categories of assignments for enlisted men. This articulation promises to be helpful to the use of both these files.

Specifications for the Continuing Development of Data Files

Data files for the ISVD and procedures for their use will undergo continuing development. There is no foreseeable end to additions or alterations to the material and its uses. Any closed system of data files is to be shunned. A general plan for development is needed in which the data files are continuously operative, but in which new information can be accepted readily and with minimum disruption of operation. Such a plan is suggested by the experience of data file development described above. It derives explicitly from the data files on occupations and military service, but should apply readily to those on education, family living, and other topics an information system like the ISVD might eventually encompass. Needed are an ability to arrange the information in terms of titles and categories, as mentioned earlier; and to translate among the various sets of titles. The files thus can be readily articulated among themselves. They potentially, therefore, are not a set of data files, but one large complex file.

Experience so far with data file development suggests certain criteria and a set of rules to meet these criteria. These may seem self evident or trivial in retrospect. But they were by no means obvious during the development of the data files described here. They might also seem excessively general in form, but this is intentional, to allow application to a wide range of cases.

1) Data files should adapt to different use depending on which discontinuity and stage of decision-making they are serving for each individual inquirer.
2) Means of entry to each data file should be independent from the file itself, so that either the means of entry or the file itself can be changed without disturbing the other.
3) Likewise, form of presentation of information from a data file should be independent from the file itself for the same reasons.
4) Files should be designed so that additions and updating are possible without undue disruption of the existing files or of their operation.

These criteria, recognized as important in development of the existing data files on occupations and military service, must be interpreted individually for each data file. The following rules have been helpful in this regard.

1) Collect information by blocks in which information in well defined categories is given for a set of well defined titles.
2) Entry to these blocks can be according to selected categories, or by title.
3) Coded information should be presented to the inquirer in English or some other readily understandable form. This in general will require structured formats within which to present the information.
4) Free access between separate blocks of information should be facilitated through explicit translation from the titles of one to the titles of the other. Properly done, this will provide flexibility and freedom in finding and taking information from the data files.

Much work remains in the preparation of data files. The job will probably never be over, since updating and additions can be expected to go on so long as there is a System. Three immediate needs, which set the stage for the near future, follow.

1) More accurate information, when and as this becomes available in readily usable form.
2) More appropriate information, aimed at individual decision-making rather than economic or large scale planning.
3) Less structured entry to the information. This is mainly a matter of information processing capability and is the task of the System as a whole, not just of the designers of data files.

Documentation of Data Files

Information about the construction, development, and implementation of data files, and the documentation of these files in the ISVD system, is presented in a series of reports.

Project Report No. 15 gives a general discussion of the requirements, preparation, and use of data files for computerized vocational guidance. Presented is a theory for data base design as it relates to the theory and activities of the ISVD.

An explanation of some of the operational techniques involved in the preparation and implementation of a data base is discussed in The Construction of a Data Base. Outlined are the activities that pertain to the collection and documentation of data, the writing of a preference script and the specification of its documentation, and the entry of the data into the computer and the running of the programs.

Detailed in Project Report No. 23 is an example description of a specific data base. This report presents the structure of the Military Data Base and its supporting script network, and discusses how the data may be accessed by the inquirer.

The use of visual material in the ISVD system is documented in the report, Visual Aspects of the ISVD. Included is the credit and copyright list of all slides in the System.

The documentation of the ISVD data files is presented in Appendix II of this report.

III. WORK ORGANIZATION AND ACCOMPLISHMENTS

WORK ORGANIZATION, 1966-70

The principal product of the ISVD project is an operating prototype of a computer-based guidance system with the characteristics specified in the grant request. The provision of that prototype required the coordinated development both of guidance materials appropriate to the theory of the System and of the computer programming and hardware necessary for the desired responsively interacting environment in which self programmed interacting materials could ultimately be achieved by an inquirer. Neither of the required materials existed at the inception of the project. We therefore organized our activity so that both sets of developments proceeded in parallel, so that continual consultation took place between persons working in the two areas, and so that three unions of the two sets of materials were to have occurred during the intended thirteen quarters of the project. The first of these unions was called the demonstration System. The demonstration System became available in August 1967. The intended intermediate union of the materials could not be arranged because of unexpected delays in achieving the necessary computer programming and because of administrative delays in procuring the needed terminal equipment. The project had to secure time on a computer which met its requirements, reprogram the time sharing system of the computer finally agreed upon, and arrange for lease and/or purchase of required terminal equipment. These demands, coupled with occasional delays in negotiating the continuation of the grant when renewal was required, sufficiently delayed our intentions so that the intended intermediate union had to be abandoned in July 1968. We subsequently went to direct programming of the final union in order to meet our obligations to field test the System as of January 1969. The final union proved rather unreliable when first started because of absence of our own experimentation with the System before permitting students to use it. However, we did manage to engage in formative evaluation of the System despite our difficulties, thanks to the good humor of our cooperating students and administrators in the Newton School Department, the Western Metropolitan Boston Regional Opportunity Council, and the Harvard Graduate School of Education.

Because of the way we worked, we had unusual opportunity in this project to achieve a harmony of technology and guidance theory heretofore unavailable in guidance development. Prior to this project, computer-based guidance systems had to conform to available technology. However, in this project available technology was allowed to modify guidance theory to only that minimal extent dictated by our intellectual and material resources. As a result we created a computer-based guidance system which brought about changes in technology, not the reverse if we could prevent it. In addition, we specified a guidance environment which is readily generalizable to an educational environment (Ellis and Tiedeman, 1970). Substantive programming other than that of career in the environment of an ISVD could well bring educational practice into a new era, a qualitatively different era from that so far supported by computer-based instructional systems (Ellis and Tiedeman, 1970).

The previous section outlined the theory of the Information System for Vocational Decisions. During 1966-67, the construction of guidance and computer materials had to proceed in parallel and the actual project activities were therefore not yet fully consonant with the dictates of theory because accomplishments were then not yet completely mature. For this reason we organized the initial work of the ISVD during its first year of operation in accord with the three broad areas, each of which consisted of two related sub-areas, as noted in our proposal recorded in Section I.

The first broad area was concerned with *the development of a computer-based data system for vocational decision-making.* The first related sub-area consisted of *the collection of data on education, training, and job characteristics and opportunities, and on the persons who will use the System.* (As has been indicated in the last part of Section II, these data are initially only first approximations of the kind eventually to be developed.) This aim was achieved during the first year of work in the following Areas of the project:

Forecasting Area
Placement Area
Information Area
Inquirer Characteristic Area
Data Files Area

1) Occupational
2) Military
3) Educational
4) Personal and Family Living
5) Inquirer Characteristics

The second related sub-area called for the *development of computer routines (computer programs) and utilization or adaptation of display devices (audio, video, tape, cartoon, film, etc.) which will connect the user, in terms of his personal characteristics, directly with the data so that he can generate information for his use in vocational decision-making.* This aim was pursued during the first year of the project through work in the Computer Area.

The second broad area of the project concerns itself with *the development of a training program, or course in vocational decision-making.* One part of this task called for the *specification and provision of the elements and process of decision-making for individuals of various ages and vocational situations.* This task was pursued during the project's first year through work in the following areas:

Decision-Making Area
Vocational Development Curriculum Area
General Curriculum Area
Psychological Curriculum Area

A second, but related, task is that of *supervised practice in decision-making for inquirers and counselors, using the computer-based* *data and routines*. This activity was necessarily given secondary emphasis during the first year of the project. These aims were focussed in the project through work in the following areas:

Educational Organization and Supervision Area
Reporting and Education Area

The third and final broad area of the project deals with the *study and assessment of the System, its users, and its use*. Since a computer-based system was not yet constructed, very little work was conducted in this Area during 1966-67.

The crystallization of the theory underlying the organization of Prototype I for the ISVD detailed in the second section of this Report, led to revision of the areas within which the activities of the project are best organized. Therefore, rather than organizing activities according to the categories listed in the First Annual Report, this Final Report organizes activities according to the following four main areas and associated sub-areas, as we did in our Second Annual Report and Third Report.

The first main area is that of preparation of *primary* data for computer control of presentation. This includes assembly, organization and filing of *primary* data in each of the following areas:

Forecasting
Occupational and Placement Alternatives
Military Alternatives
Educational and Admissions Alternatives
Family Living

An additional sub-area of activity is computer control of presentation of this material.

The second main area is concerned with decision-making and the generation of information through coordination of *secondary* data files, computer processing, and personal activities. Both instruction in decision-making and practice in decision-making by means of games are coordinated with *primary* data files.

Deciding and vocational development, and, deciding and agency development are coordinated through *secondary* data files. Also included in this second main area of activity is the computer control for processing of *secondary* data. An additional activity is that of counseling and supervision in the ISVD along with the required reorganization and re-education.

The third main division of activity is that of study and assessment of the System.

The activities and accomplishments of the project are reported in detail in the First, Second, and Third Annual Reports of the project. In addition, thirteen quarterly reports have been submitted which provide a detailed record of the work of the project. Since these annual and quarterly reports can be made available upon request, we refrain from detailed reporting of accomplishments here. Instead, we limit final reporting to an overview of the activities of each of the several areas in which the project worked.

PREPARATION OF PRIMARY DATA FOR COMPUTER CONTROL OF PRESENTATION

Assembly, Organization and Filing of Primary Data

FORECASTING AND ASSOCIATED DATA FILE

Professional Personnel

Russell Davis and Richard Durstine, Directors; Lynne Fitzhugh, Elizabeth Truesdell, Richard Truesdell, Laurence Wolff, and Patricia Yee

Summary

The overall plan for assembling and making occupational forecasts available consisted of the following general phases:

June 1966 - August 1967	1. Develop methodology and assemble data
September - November 1967	2. Apply methods to data and establish classification for online use and updating
December 1967 - February 1968	3. Establish operating system for Prototype I
March - June 1968	4. Implement 2 and 3 above for Prototype I
July - August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September 1968 - March 1969	6. Implement Prototype II
April - June 1969	7. Field test Prototype II
July 1969 - June 1970	8. Final reporting

The overall plan reached its Phase 6, and continued there due to delays in the field test. This data file was therefore not field tested as called for in Phase 7. Instead specifications and basic data have been delivered as Project Report Number 24. Further details are indicated in Technical Memoranda 2 and 4 and in Project Report Number 21.

OCCUPATIONAL AND PLACEMENT ALTERNATIVES AND ASSOCIATED DATA AND FILES

Occupational Alternatives and Associated Data File

Professional Personnel

Russell Davis and Richard Durstine, Directors; Lynne Fitzhugh, Noel F. McGinn, Richard Truesdell, and Patricia Yee

Summary

The overall plan for constructing the occupational data file consisted on the following general phases:

June 1966 - August 1967	1.	Survey needs, available systems and data. Assemble data. Experiment with models for data retrieval of occupational data file
September - November 1967	2.	Construct and revise data file
December 1967 - February 1968	3.	Plan and do cross-referencing
March - June 1968	4.	Implement 2 and 3 above for Prototype I
July - August 1968	5.	Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September 1968 - March 1969	6.	Implement Prototype II file
April - June 1969	7.	Field test Prototype II
July 1969 - June 1970	8.	Final reporting

The overall plan for constructing and using the occupational data file was achieved. Details are indicated in Project Reports Numbers 6, 15, and 24.

Library of Occupational Facts

Professional Personnel

Roger Brown and Edward Landy, Directors; Duncan Circle, David Clemens, Wallace Fletcher, Dorothy Kunberger, Lawrence Lerer, James McDade, and Eugene Wilson

Summary

The overall plan for library assembly and use consisted of the following general phases:

June 1966 - August 1967	1. Assemble, classify, and make available occupational information in Career Resources Center
September 1967 - May 1969	2. Update information as necessary
September 1967 - February 1968	3. Use information in Prototype I both as scripts themselves and as reference material supporting script purposes
March - June 1968	4. Implement 3 above for Prototype I
July - August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September 1968 - March 1969	6. Implement Prototype II
April - June 1969	7. Field test Prototype II
July 1969 - June 1970	8. Final reporting

The overall plan was achieved. The *Career Information Service: A Guide to Its Development and Use* (by Duncan Circle, David Clemens, Arthur Kroll, and Dorothea Overholt) which reports this activity is available for a small fee from the Division of Occupational Education, Massachusetts Department of Education, 182 Tremont Street, Boston, Mass. 02111

Placement and Career Resources Centers

Professional Personnel

Roger Brown and David Archibald, Directors; Duncan Circle, Lawrence Dougherty, Allan Ellis, Edward Landy, Sheila Leahy, Lawrence Lerer, Terence O'Mahoney, Dorothy Swithenbank, and Myra Trachtenberg

Summary

The overall plan for placement and career resource centers consisted of the following general phases:

June 1966 - May 1969	1. Establish placement and career resources centers in high school, college, graduate school, and employment institutions. Plan for computer activities in placement
September 1967 - March 1968	2. Prepare placement activities for

	computer in relation to Prototype I
April - June 1968	3. Implement materials from 1 and 2 above for Prototype I
July - August 1968	4. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September 1968 - March 1969	5. Implement Prototype II
April - June 1969	6. Field test Prototype II
July 1969 - June 1970	7. Final reporting

The overall plan for Career Resources Centers called for both to reach Phase 7. The Newton Center did; the Harvard Graduate School of Education Center only reached Phase 5. Details about these Centers may be found in the three ISVD Annual Reports.

MILITARY ALTERNATIVES AND ASSOCIATED DATA FILE

Professional Personnel

Russell Davis and Richard Durstine, Directors; Lynne Fitzhugh, Laurence Wolff, and Patricia Yee

Summary

The overall plan for constructing the military data file consisted of the following general phases:

June 1966 - August 1967	1. Survey needs, available systems and data. Assemble data. Experiment with models for data retrieval
September - November 1967	2. Construct data file
December 1967 - February 1968	3. Plan and do cross-referencing required among data files
March - June 1968	4. Implement 2 and 3 above for Prototype I
July - August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II

September 1968 - March 1969	6. Implement Prototype II file
April - June 1969	7. Field test Prototype II
July 1969 - June 1970	8. Final reporting

Work in this sub-area, the earliest in which information was ready for operational use, still could be brought only to its Phase 6 in the project. Because of other higher priorities it was not possible to bring this file into operation during the field test. Therefore Phase 7 for this area could not be realized, but the implemented data file appears in Project Report Number 23.

EDUCATIONAL AND ADMISSIONS ALTERNATIVES AND ASSOCIATED DATA FILE

Professional Personnel

Robert O'Hara and David Clemens, Directors; Robert Aylmer, Duncan Circle, Richard Durstine, Carl Edwards, Allan Ellis, Marietta Haley, Thomas Hutchinson, Arthur Kroll, Dorothy Kunberger, Lawrence Lerer, Priscilla Little, Jo Weissman, and Patricia Yee

Summary

The overall plan for constructing the education data file consisted of the following general phases:

June 1966 - August 1967	1. Survey of needs and available systems
September - November 1967	2. Plan for implementing of college file, trade school, high school and junior high school files
December 1967 - February 1968	3. Plan and do cross-referencing required among data files
March - June 1968	4. Implement 2 and 3 above for Prototype I
July - August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September 1968 - March 1969	6. Implement Prototype II files
April - June 1969	7. Field test Prototype II
July 1969 - June 1970	8. Final reporting

Four educational data files and associated scripts were brought to completion as called for in Phase 7. A description of each of these is given in the Third Report.

FAMILY LIVING AND ASSOCIATED DATA FILE

Professional Personnel

Charles Gunnoe and David Tiedeman, Directors; Myra Gannaway, John Page, and Esther Wiedman

Summary

The overall plan for constructing the family living data file consisted of the following general phases:

June 1966 - November 1967	1.	Survey of ISVD needs and available procedures
December 1967 - August 1968	2.	Plan and construct data file
September 1968 - March 1969	3.	Implement data file for Prototype I. Do restricted field testing of Prototype I to develop specification modifications for Prototype II. Implement Prototype II
April - June 1969	4.	Field test Prototype II
July 1969 - June 1970	5.	Final reporting

Because of more urgent priorities, only Phase 3 in the overall plan for this area was reached when the field test had to be terminated. The few details on this file are recorded in the three ISVD Annual Reports.

Computer Control for Presentation of Primary Data

Professional Personnel

Allan Ellis, Director; Thomas Hutchinson, Assistant Director; Roy Norris, Director of Systems Design; David Archibald, Toby Boyd, David Brewster, Peter Christie, Barbara Howley, Susan Kaiser, Marjorie Madoff, Dana Quitslund, Margaret Razar, Charles Roehrig, Richard Roman, Susan Roman, Stanley Schainker, Arlene Scherer, Arnold Smith, Dorothy Swithenbank, Thomas Swithenbank, Heather Scott, Herbert Simons, Ann Taylor, Jeffrey Tiedeman, Michael Tiedeman, and Charles Wetherell

Consultants

Calvin Mooers, Graham Smith

Sub-Contractor

Computer Associates

June 1966 - February 1967	1. Explore existing software and hardware
March - June 1967	2. Test and evaluate techniques uncovered in exploration
July - November 1967	3. Specify Prototype I (Computer)
December 1967 - June 1968	4. Implement Prototype I
June - September 1968	5. Test and refine Prototype I
September - October 1968	6. Specify Prototype II (Computer)
October 1968 - March 1969	7. Implement Prototype II (Guidance)
April - June 1969	8. Test and refine Prototype II
January 1969 - June 1970	9. Specify Prototype III

The third year of the ISVD project brought all the work of the previous two years to bear on the problem of implementation; specifically, Phase 8 was to have been reached and it actually was. Details of work in this area can be found in Technical Memoranda 1 and 3 and in Project Reports Numbers 11, 14, and 29.

DECISION-MAKING AND THE GENERATION OF INFORMATION THROUGH COORDINATION OF SECONDARY DATA FILES, COMPUTER PROCESSING, AND PERSONAL ACTIVITIES

Decision-Making

INSTRUCTION IN DECISION-MAKING AND ITS COORDINATION WITH PRIMARY DATA FILES

Professional Personnel

Lawrence Lerer, Robert O'Hara, and Eugene Wilson, Directors; Margaret Addis, Diana Kronstadt, Dorothy Kunberger, James McDade, Richard Roman, and Susan Roman

Summary

The overall plan for constructing scripts in decision-making was presented in the First Annual Report in two sub-sections: decision-making area; and vocational development area. In the Second Annual Report this aim of the sub-section was separated according to its function, namely instruction in decision-making and its coordination with *primary* data files.

The overall plan for constructing *instruction* in decision-making therefore actually consisted of the following general phases:

June 1966 - August 1967	1. Construct and field test decision-making booklet for junior high school. Specify behavioral goals and write necessary scripts
September - November 1967	2. Organize, winnow, and edit scripts
December 1967 - February 1968	3. Revise scripts, add needed scripts, and provide scripting of interchanges among scripts as well as data assembly for MONITOR
March - June 1968	4. Implement 3 as Prototype I
July - August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September 1968 - March 1969	6. Implement Prototype II
April - June 1969	7. Field test Prototype II
July 1969 - June 1970	8. Final reporting

The plan for this Section was realized. Details are reported in Project Report Number 7 and in relevant sections of the three ISVD reports.

PRACTICE IN DECISION-MAKING THROUGH GAMES AND ITS COORDINATION WITH PRIMARY DATA FILES

Professional Personnel

David Archibald, Allan Ellis, and Eugene Wilson, Directors; Susan Baldwin, Charles Gunnoe, Diana Kronstadt, Dorothy Kunberger, James McDade, and Margaret Razar

Sub-Contractor

Abt Associates

Summary

The overall plan for constructing the decision-making curriculum consisted of the following general phases:

June 1966 - August 1967	1. Construct and field test decision-making booklet for junior high school

September 1966 - August 1967	2. Survey career games
September - November 1967	3. Plan educational, career planning, and achievement motive games
December 1967 - March 1969	4. Prepare scripts called for in 3 above
April - June 1969	5. Implement 4 above as Prototype II without having a Prototype I
July - August 1969	6. Do restricted field testing of Prototype II to develop further specifications
September 1969 - June 1970	7. Final reporting

The plan was fulfilled but no field testing could be arranged. Details are reported in the three ISVD reports.

Psychology

DECIDING AND VOCATIONAL DEVELOPMENT AND THEIR COORDINATION THROUGH SECONDARY DATA FILES

Professional Personnel

Roger Brown, Duncan Circle, Thomas Hutchinson, Lawrence Lerer, Robert O'Hara, and David Tiedeman, Directors; Robert Aylmer, Gordon Dudley, Allan Ellis, Elaine Fisher, Wallace Fletcher, Charles Gunnoe, Diana Kronstadt, Dorothy Kunberger, James McDade, Terence O'Mahoney, Margaret Razar, and Eugene Wilson

Consultants

Warren Gribbons, Regis College; and George Pasquella, University of Iowa

Summary

The First Annual Report and its two subsequent Quarterly Reports dealt with the areas of inquirer characteristics data file, general curriculum, and vocational development curriculum. These three areas are somewhat differently defined in the two subsequent reports as well as in this one and also are treated somewhat simultaneously.

The differences in treatment include:

A. Inquirer Characteristics are divided into two kinds, general and personal. General inquirer characteristics are of course personal but their use in the ISVD is intended for a more general audience than the inquirer himself. The two audiences which will be permitted access to these general characteristics are other inquirers, when the characteristics of all inquirers are treated anonymously, and counselors, when the characteristics of a specific inquirer are identified by his name. This latter use category will provide for traditionally permitted access to cumulated grades and other data on the educational progress of student inquirers. General inquirer characteristics are reported in this subsection. Personal inquirer characteristics will be reported in the subsection immediately following.

B. The purpose of the so-called General Curriculum was more sharply focussed after the first year. ISVD interest in the General Curriculum was henceforth only twofold. On the one hand, ISVD provided categorizations of terms in primary data files which permit access at a more functional level than the descriptions of the activities themselves. This level of cross-referencing is already somewhat inherent in the *primary* data files as presently organized. However, the *primary* organization was planned and implemented without explicit attention to the coordination of categories when the use demanded is conceived in terms of vocational and/or agency development. It is this coordination which represents the present second interest of ISVD in the general curriculum. This is why the general curriculum is sequenced in this Report between consideration of inquirer characteristics and the Self Attributes and Deciding instructional scripts.

C. The Vocational Development Curriculum is here limited to instruction in self attributes and their relation to educational and vocational opportunities. This instruction is being assembled in scripts here referred to as those on Self Attributes and Deciding.

The overall plan for coordination of deciding and vocational development through secondary data files is presently conceived according to the following general phases which are somewhat specific to the origins of the three parts of the now combined task as is noted in the headings of each of the last three columns: [see p. 58]

Phases A.5., B.5., and C.5. were completed but only in the limited prototype form which was planned.

The report on the visual aids developed in ISVD appears in the ISVD Third Report.

DECIDING AND AGENCY DEVELOPMENT AND THEIR COORDINATION THROUGH SECONDARY DATA FILES

Professional Personnel

Robert Aylmer, Charles Gunnoe, and David Tiedeman, Directors; Myra Gannaway, Terence O'Mahoney, John Page, Margaret Razar, Esther Wiedman, and Patricia Yee

	A. *Inquirer Characteristics: General*	B. *Cross-Referencing of Data Files: General*	C. *Self Attributes and Deciding*
June 1966-November 1967	A.1. Plan cumulative record file and collect and code data for subjects likely to be used in field test of Prototype II	B.1. Survey for study-work links for use in cross referencing of education, occupation, and inquirer characteristics data files	C.1. Write behavioral specifications. Write scripts, Organize, winnow, and edit scripts
December 1967 - June 1968	A.2. Implement cumulative record. Provide Durstine-Wolff type of retrieval capacity. Provide for merging and subsequent accessing of inquirer characteristics secured from vocational development, decision-making, general education, and psychological curricula	B.2. Provide and do cross-referencing of education, occupation, and inquirer characteristics data files	C.2. Revise scripts, add needed scripts, and provide scripting of interchanges among scripts as well as data assembly for MONITOR
July-August 1968	A.3. Implement Phases 2 and 3 above as Prototype I and engaged in limited field trials to secure specification modifications of file for Prototype II	B.3. Implement 2 for Prototype I and engage in limited field testing of Prototype I to develop specification modifications for Prototype II	C.3. Implement 2 as Prototype I and engage in limited field testing of Prototype I to develop specification modifications for Prototype II
September 1968 - March 1969	A.4. Implement Prototype II file	B.4. Implement Prototype II file	C.4. Implement Prototype II file
April-June 1969	A.5. Field test Prototype II	B.5. Field test Prototype II	C.5. Field test Prototype II
July 1969-June 1970	A.6. Final reporting	B.6. Final reporting	C.6. Final reporting

Summary

The overall plan for designing the system to facilitate emergence of agency behavior through repeated interaction in ISVD consisted of the following general phases:

June 1966 - August 1967	1. Provide general theory on thought, choice and action
September - November 1967	2. Specify sense of agency. Test scripts against concept. Plan for additional scripts and assessment and storage of assessments
December 1967 - February 1968	3. Write additional scripts. Continue planning on psychology and ISVD
March - June 1968	4. Implement Phases 2 and 3 as Prototype I
July - August 1968	5. Do restricted field testing to develop specification modifications for Prototype II
September 1968 - March 1969	6. Implement Prototype II
April - June 1969	7. Field test Prototype II
July 1969 - June 1970	8. Final reporting

The work in this sub-area did not actually reach implementation until late June 1969. Hence, no extensive field testing of the procedures could be undertaken but staff did test out rudimentary illustrations of MONITOR.

Computer Control for Processing of Secondary Data

Professional Personnel

Allan Ellis, Director; Thomas Hutchinson, Assistant Director; Roy Norris, Director of Systems Design; David Archibald, Toby Boyd, David Brewster, Barbara Howley, Susan Kaiser, Marjorie Madoff, Dana Quitslund, Margaret Razar, Charles Roehrig, Richard Roman, Susan Roman, Stanley Schainker, Arlene Scherer, Heather Scott, Arnold Smith, Dorothy Swithenbank, Thomas Swithenbank, Herbert Simons, Ann Taylor, Jeffrey Tiedeman, Michael Tiedeman, and Patricia Yee

Consultant

Graham Smith

Summary

ISVD was organized so that design of the computer and guidance systems proceeded apace, but interactively, to the extent that interaction could be arranged and maintained. In this regard the computer area originally offered the guidance area the computer capability planned as MINORCA. The guidance personnel accepted this design and worked within within it during the Fifth and Sixth Quarters. During that time it became apparent that the capability originally planned for MINORCA needed augmentation by some of the capability inherent in ELIZA.

The procedural modification required by the incorporation of some ELIZA-like function in MINORCA was referred to in an earlier sub-section entitled "Computer Control for Presentation of Primary Data." Also, the experiments leading to orientation scripts in ELIZA are reported in the immediately preceding sub-section.

The primary focus of these existing scripts is toward both orientation and Access Routines, where the need for natural language processing seems paramount. The success of this exploration causes our replacement of the MINORCA action statement by a modified ELIZA.

The theory of ISVD requires an English-like response. Recently a visitor to ISVD attempted the ELIZA orientation scripts. Upon reflection, he said, "The System is not really responding to me." This statement represents both the dialectic within which *we* work to improve the System and the theoretical imperative which ISVD helps *a person* to realize and accept psychologically. The dialectic will be responded to during field test and specifying revision of Prototype II in our efforts to make the System ever more capable of personal-like responses. However, the fact of the matter is that personal-like statements will *never* fully be possible in any mechanical system. Therefore ISVD uses this foregone conclusion to interact with inquirers in a system, *seemingly* antithetical to it, 1) to teach them how to do things which can be done mechanically, 2) to let them do things in their career development with mechanical and personal help, and 3) to encourage them to rejoice in ultimate realization of the truth that life is theirs, not that of any machines.

ELIZA-like computer capability contributes to this theory in important ways. In the first place ELIZA-like computer capability permits programming in which a person may pass to parts of the System beyond those where he now works simply by mentioning the right words *which do not have to be told to him beforehand*. In this regard, ELIZA gives the illusion that it is completely responsive to the inquirer's thoughts and needs. However, as the inquirer experiences the realization that ELIZA does not completely respond to him, he will then be helped by being taught what ELIZA actually *is* responding to. He will also in some regards be empowered to write and use personal programs in ELIZA-like forms. This activity will aid the inquirer to internalize the illusion of free response in a mechanistic environment. The experience, the practice, and aid at generalization by counselor and job supervisor will then help to complete the process by bringing a person to live the differentiated mechanical circumstance of the illusion without attributing power to it which is not the power of his own thought and action.

Counseling and Supervision in the ISVD and Required Re-Organization and Re-Education

Professional Personnel

David Archibald, Sara Booth, Russell Davis, Gordon Dudley, Richard Durstine, Wallace Fletcher, Edward Landy, Sheila Leahy, Lawrence Lerer, Priscilla Little, Robert O'Hara, David Tiedeman, Eugene Wilson, and Michael Wilson

Summary

The overall plan for both providing counseling and supervision in the ISVD and for facilitating the required re-organization and re-education was reported in separate sections in the First Annual Report and its two subsequent Quarterly Reports. Those two sub-sections were combined in the Second and Third Reports in order to demonstrate more of the coordination and direction which is involved in attempting to create a critical mass by the expiration of the present ISVD grant which was to have been sufficient in size to pick up and sustain the momentum which we created with help of resource from the U.S. Office of Education. The following general phases guided activity along these lines:

		A. *Re-Organization of Counseling and Supervision*		B. *Re-Education and Revision of Support*
June 1966 - June 1969	A.1.	Establish relationships with NEEDS, Newton, WEMBROC, and other institutions required for resources, data and field testing of Prototype II	B.1.	Issue reports as they become available. Engage in professional activity designed to bring resources into the ISVD and to ready counselors and vocational educators for the ISVD
March 1967 - June 1969	A.2.	Establish and help to maintain the extra support activities required in NEEDS, Newton, and WEMBROC for a try out of Prototype I and field testing of Prototype II	B.2.	Incorporate graduate students into ISVD to prepare them for subsequent use of ISVD
January 1966 - February 1968	A.3.	Plan for MONITOR and supervision. Mount rudimentary MONITOR for Prototype I		
March - June 1968	A.4.	Implement 3 for Prototype I		
July - August 1968	A.5.	Do restricted field testing of Prototype I to develop specification		

	modifications for Prototype II. Expand MONITOR as much as possible	
September 1968 - March 1969	A.6. Implement 5 above as Prototype II. Prepare directions for supervision during field test and train needed support personnel	
April - June 1969	A.7. Field test Prototype II	B.3. Conduct institutes for persons who are likely to become users of ISVD
July 1969 - June 1970	A.8. Final reporting	B.4. Final reporting

Phase A.1. took place as planned. Phase A.2. took the form of a Career Resources Center maintained in collaboration with the Newton School Department. Phases A.3. - A.8. were completed as planned. The education part of the B sub-area also occurred on schedule. Details are noted in the three ISVD Reports.

STUDY AND ASSESSMENT OF THE SYSTEM

Professional Personnel

Terence O'Mahoney and David Tiedeman, Directors; Robert Aylmer, Duncan Circle, Richard Durstine, Allan Ellis, Wallace Fletcher, Myra Gannaway, Thomas Hutchinson, Edward Landy, Sheila Leahy, Robert O'Hara, Richard Roman, Myra Trachtenberg, Eugene Wilson, Michael Wilson, and Patricia Yee

Summary

The overall plan for study and assessment of the ISVD consists of the following general phases:

June 1966 - June 1968	1. Plan, construct, and implement Prototype I
July - August 1968	2. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September 1968 - March 1969	3. Implement Prototype II
April - June 1969	4. Do general field testing of Prototype II
July 1969 - June 1970	5. Prepare final report. Write

specifications for Prototype III.
Deliver Prototype II and specifications for Prototype III

Work was completed as scheduled. Details on the formative evaluation of the System are given in the Third Report and in Project Report 36. We merely record an overview here.

Summary of Trial Implementation Activities and Discussion

1. The time spent in the field was very much less than had been planned. Consequently, several strategies could not be employed (e.g., varying the number and frequency of interactions, studying long-term users' interaction patterns and seeking developmental changes in decisioning and strategizing in relation to career.)

2. For several reasons, the activities at Bigelow and Newton High School were more methodical and intensive than elsewhere. WEMBROC and HGSE were the least active and least successful of the field test sites.

3. Viewed as a *service* to its users, the ISVD was far from successful. Vital functions and processes worked erratically, hardware and software both failed frequently causing unacceptable delays at the console, the time-sharing function -- basic to such a service -- proved to be unreliable when more than four inquirers used the system simultaneously. But this trial implementation was not intended to be considered as a service to a client. This has been repeatedly and publicly stated. Nevertheless many of the system's critics have viewed the system from this standpoint and have compared it unfavorably (and rightly so) with systems which were intended to, and do, provide just a data processing service to aid in occupation or college choosing. Obviously it is pointless to criticize something for not being what it cannot yet be.

4. One point should be made clear and explicit at this juncture in relation to the comparisons drawn between ISVD and other functioning systems. The ISVD is not and was never intended to be a simple data processing-retrieval system. It has always been intended that the ISVD should be an *information generating* system, where that phrase relates to the process of helping an individual to achieve meaning (personal, significant meaning) by bringing facts and data about self and the world into relationship with already existing meanings (information) such that new understandings are attained.

To contrast the Information Generating System (very crudely) with a Data Processing and Retrieval System: the latter requires that the individual inquirer know what his question is and be able to state it specifically enough, in terms of the system, for the system to be able to accept it and process and retrieve data to answer the question; on the other hand, the information generating system is more concerned with explicit, specifiable questions *as its end product*. The primary concern of the information generating system is the catalyzing of semantic and logical processes, experiencing and learning in such a way as to bring about clearer understandings of situations, issues, problems and self on the basis of which "right" or "good" questions may be asked of the Data Processing System.

5. Previous annual reports, the original proposal for ISVD and several of its Project Reports and other papers have, collectively, pointed to dozens of separate functions and processes which are relevant and necessary to an ideal information generation system. It has been the stated goal of the Information System to attempt to operationalize as many of these features as proved possible for a Prototype II implementation. Feasibilities have been at issue, not elegance, efficiency, economic viability or validation of theories of human behavior. It is in this frame of reference that we should consider the generalized account of our activities in the field presented in full in the Third Report and the more detailed and systematic evaluations which are in preparation.

6. Students, student-counselors, counselors, teachers, parents and interested others, have all agreed that the goals we have been attempting are worthwhile and desirable. They and the ISVD personnel are equally agreed upon the fact that what we produced was not the most flattering and successful demonstration of our concepts and purposes.

7. Nevertheless, we have clearly demonstrated that it is *possible* to:

a) interact with an inquirer in a natural language medium;
b) interact with several inquirers simultaneously;
c) recognize and respond appropriately to individual requests;
d) carry on a discourse such that an inquirer may progress from a general statement of his need to a specific statement which enables a data base to be addressed and relevant data to be retrieved;
e) provide additional data which was not specifically requested, but which appears to be relevant;
f) operate in relation to several data files, and to move from one to another, on the basis of analysis of the natural language input or more artificial command language;
g) provide facts and data at various levels of specificity to suit the mode in which the user is operating;
h) present textual teaching-type materials with visual supplement where appropriate or on demand;
i) to branch and link laterally and vertically through numerous teaching-type scripts and from these to other routines such as direct access, preference or template scripts so that specific facts or data may be obtained to clarify a particular point when most relevant and useful;
j) present complex evaluative and heuristic procedures;
k) keep track of (monitor) an individual's movements through the system and store records of these movements;
l) use these records in order to:
  i) provide summaries of interactions,
  ii) use summaries of previous interactions for purposes of review,
  iii) tailor, to some extent, the presentation of materials on successive passes through the same scripts or routines;

m) use specific stored records (such as stated preferences or self evaluations) at a later time to compare with current statements of a similar nature in order to illustrate change, development, inconsistence or other such aspects of the user's interactions.

We have, in fact, demonstrated that many of the desired features of a computerized guidance system may be operationalized right now.

8. One fact has become increasingly clear as the ISVD has developed; a truly interactive man-machine system for individualized instruction and guidance is unlikely to be achieved without a well developed "natural language" processing system.

Although our own language, GLURP, is still somewhat crude we have observed and experienced tremendous advances in our capacities to implement our necessary and our desirable functions as the language has been developed and improved. If one achievement alone had to represent ISVD's activities, then perhaps this should be it.

9. In a very real sense, the field testing has been a testing of GLURP, at least at the highly visible interface between user (or observer/critic) and the system. In terms of demonstrating feasibilities, the trial implementation has been a success.

In another sense, too, it has been successful since it has shown quite clearly many ways in which system content, functions and processes need revision or improvements. Since another of the stated goals of the trial implementation was that of assessing the system for the purpose of incorporating recommendations and specification for a better system in Prototype III, this too has been achieved.

10. Some of the needed modifications were incorporated into the system during the field trials; others have been included since, and yet others exist in specifiable form.

11. Although it is true to say that ISVD is not yet a well-functioning system, we may now claim that we have developed the raw materials and techniques out of which to fashion a viable information system for career planning and development in relation to specialized user-populations (say junior and senior high schools in Massachusetts, Technical Schools in Massachusetts, Texas, and Wisconsin, or ghetto unemployed).

ADDITIONS TO THE SCRIPT SYSTEM

Professional Personnel

David Tiedeman, Director

Sub-Contractor

New England School Development Council (NESDEC)

The NESDEC Center for Educational Software Development (ESD), at the request of David Tiedeman, engaged to expand the ISVD script and database system from the Career Information Service (CIS), a project of the Massachusetts Bureau of Vocational Education in cooperation with the Newton Public School System.

The materials used consisted of 7,404 reference materials accumulated by CIS over several years. These references were organized by the particular occupations and according to the Dictionary of Occupational Titles (DOT) numerical classification.

Under this contract, ESD has written a total of 16 ISVD-type scripts, amounting to 19,000 punched cards of data. These were then loaded onto computer disc storage, along with the ISVD occupations database and several of the important ISVD occupations scripts. The CIS references are accessible by both two-digit and three-digit DOT classifications. Thus, bibliographic material is available for the 64 two-digit categories and the 445 three-digit categories for which the CIS had materials available.

The finished system, including CIS material, permits a user via a teletypewriter connected to a computer to create a list of jobs meeting one's specifications; to secure data concerning any or all of these jobs; and, by using the CIS scripts, to secure lists of reference materials (title, author, publisher, pages, date) giving further, more detailed information about these jobs.

It should be noted that the finished system referred to here does not include a large amount of the original ISVD material (notably the education scripts and databases) because the original system was designed for four disc storage devices and only two are currently available. Of course, the CIS scripts as implemented under this contract by ESD will function on a four-disc system.

IV. AUTHORITY AND PERSONNEL OF THE INFORMATION SYSTEM FOR VOCATIONAL DECISIONS

AUTHORITY OF THE INFORMATION SYSTEM FOR VOCATIONAL DECISIONS

In liaison through the United States Office of Education

Norman Boyan, Acting Associate Commissioner, Bureau of Research, Office of Education (1969)
R. Louis Bright, Associate Commissioner of Research, Office of Education (through 1969)
Clay V. Brittain, Project Officer, Human Resources Branch, Division of Adult and Vocational Research
David E. Bushnell, Director, Division of Comprehensive and Vocational Education Research
Lawrence G. Gobel, Acting Branch Director, Basic Studies Branch, Division of Comprehensive and Vocational Education Research (January 1968 -)
Eunice Jones, Project Officer, Human Resources Branch, Division of Adult and Vocational Research (through November 1966)
Richard B. Otte, Project Officer, Human Resources Branch, Division of Adult and Vocational Research (December 1966 - October 1967)
David Pollin, Deputy Associate U.S. Commissioner (Research)
Alice Y. Scates, Branch Director, Basic Studies Branch, Division of Comprehensive and Vocational Education Research (through December 1968) Senior Program Associate, Program Planning and Evaluation, Bureau of Research (January 1969 -)
Judith D. Weinstein, Project Officer, Basic Studies Branch, Division of Comprehensive and Vocational Education Research

In liaison, Division of Vocational Education, Department of Education, Commonwealth of Massachusetts

Walter Markham, Director of Bureau of Vocational Education
John P. Morine, Member of Advisory Committee; and Senior Supervisor, Occupational Information and Vocational Guidance

In liaison through the Office of the Dean, Harvard Graduate School of Education

Jane Batchelder, Administrative Assistant in charge of Personnel (through 1968)
Herman F. Eschenbacher, Member, *ex officio*, Advisory Committee (resigned June 1967), Librarian; and Lecturer in Education
Dorothy A. Johnson, Administrative Assistant in the Office of the Dean
Edward G. Kaelber, Associate Dean (resigned February 1968)
Paul A. Perry, Assistant Dean
Gertrude Rogers, Administrative Assistant in charge of Personnel
Richard R. Rowe, Associate Dean (February 1968 -)
Theodore R. Sizer, Member, *ex officio*, Executive Committee, and Dean

Richard C. Wheeler, Associate Director of Placement
Ronald Wormser, Assistant to the Dean for Administration

In liaison through the New England School Development Council-New England Education Data Systems

Raimond Bowles, Director of Finance, NESDEC
Richard Goodman, Executive Secretary, NESDEC-NEEDS; Chairman, Board of Directors, NEEDS (through summer 1969)
Hilton C. Holland, Chairman, Executive Committee, NESDEC
Robert Ireland, Executive Secretary, NESDEC (summer 1969 -)
Eugene Park, Director of School Services, NEEDS
Michael Wilson, Executive Officer, NESDEC-NEEDS (resigned 1969)

In liaison through the Western Metropolitan Boston Regional Opportunity Council (WEMBROC)

John H. McPherson, Manpower Director

In liaison, Technical Institutes

Paul Berwick, Admissions and Counseling, Springfield (Massachusetts) Technical Community College
Richard Borowski, Counseling Center, Milwaukee Technical Institute
John Bugbee, Biomedical Technical Instruction, Springfield (Massachusetts) Technical Community College
Jimmy Hunter, Paul Quinn College (Waco, Texas)
Elmer Kuntz, James Connally Technical Institute (Waco, Texas)
Thomas Penkwitz, Computer Area, Milwaukee Technical Institute
Dennis Redovich, Placement Center, Milwaukee Technical Institute
Alfred St. Onge, Computer Systems, Springfield (Massachusetts) Technical Community College
Theodore Talbot, Paul Quinn College (Waco, Texas)

Advisory Committee

+*E. Gil Boyer (resigned April 1966), Administrator, NEEDS (June 1963 - June 1966)
Charles T.W. Curle, Professor of Education and Development, Harvard Graduate School of Education
+*Russell G. Davis, Professor of Education and Development; Research Associate in the Center for Studies in Education and Development, Harvard Graduate School of Education
Howard W. Dillon (appointed June 1967), Librarian, Harvard Graduate School of Education
+*Richard M. Durstine, Research Associate in Center for Studies in Education and Development; Lecturer in Education, Harvard Graduate School of Education

+*Allan B. Ellis, Director, Center for Educational Software Development, NESDEC; Lecturer in Education, Harvard Graduate School of Education
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+*Wallace J. Fletcher, Research Associate, Harvard Graduate School of Education; President, Western Metropolitan Boston Regional Opportunity Council
Thomas E. Kurtz (appointed June 1967), Director, Kiewit Computation Center, Dartmouth College
+*Edward Landy, Assistant Superintendent of the Newton Public School System and Director of Pupil Personnel Services and Special Education, Newton Public School Department
Emmanuel G. Mesthene, Executive Director, University Program on Technology and Society, Harvard University
John D. Morine, Senior Supervisor, Occupational Information and Vocational Guidance, Division of Vocational Education, Department of Education, Commonwealth of Massachusetts
+*Robert P. O'Hara, Executive Director, Information System for Vocational Decisions
*Theodore R. Sizer, *ex officio*, Dean, Harvard Graduate School of Education
+*David V. Tiedeman, Chairman; Professor of Education, Harvard Graduate School of Education; Chairman, Executive Committee, Information System for Vocational Decisions
+*Michael J. Wilson, Executive Officer, New England Education Data Systems (resigned 1969)
Norman Zachary, Director, Harvard Computing Center (resigned April 1967)

+Principal Investigator
*Member of Executive Committee

Research Associates

David K. Archibald (October 1968 -)
Roger D. Brown (September 1968 - July 1969)
Duncan F. Circle (resigned June 1968)
David B. Clemens (resigned June 1967)
Thomas E. Hutchinson (December 1968 -)
Arthur M. Kroll (resigned June 1967)
Lawrence Lerer (resigned December 1968)
Noel F. McGinn (resigned January 1967)
Terence J. O'Mahoney (December 1968 -)
Stephen Purcell (summer 1967)
Eugene H. Wilson (resigned October 1968)

System Specialists

David Brewster (resigned June 1969)
Roy E. Norris, Jr.
Heather Scott
Graham Smith (November 1968 - February 1969)
Ann W. Taylor

Programmers

Toby Boyd (resigned October 1968)
Arlene Scherer (resigned April 1969)

Computer Operators

M. Susan Kaiser
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Principals (Newton School Department)

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Muriel L. Lundy
Richard W. Mechem

Counselors (Newton School Department)

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Dorothy Kunberger
James McDade
Archibald Stark
Myra Trachtenberg

Scriptwriters

Jon H. Abrahamson (summer 1967)
Margaret Addis (summer 1967)
Gerald Bazer (summer 1967)
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Neil Curran (summer 1967)
Hope Danielson (summer 1967)
Sara Eddy (summer 1967)
Gail Gassen (summer 1967)
James Hartman (summer 1967)
Robert W. Hayes (summer 1967)
Patricia Kelley (summer 1967)
Frank Lambert (summer 1967)
Cecile P. LeClair (summer 1967)
Paul H. Linscott (summer 1967)
Peter A. Mackie (summer 1967)
Dorothy A. Mahoney (summer 1967)
James M. McGovern (summer 1967)
Linda McLean (summer 1967)
Carolyn Mellor (summer 1967)
Emory Miller (summer 1968)
William H. Moore, Jr. (summer 1967)
Vivian Parker (summer 1967)
Bruce Pelton (summer 1967)

Catherine Psyhogios (summer 1967)
Robert M. Rosenblatt (summer 1967)
Howard Schofield (summer 1967)
Anne Stamas (summer 1967)
Archibald Stark (summer 1967)
Nancy Swidler (summer 1967 and 1968)
Armine D. Thomason (summer 1967)
Joseph M. Utka (summer 1967)

Audio Visual Specialist

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Administrative Assistants and Associate Editors

Sara S. Booth (resigned April 1969)
Sheila Leahy (April 1969 - August 1969)
Nona D. Strauss (September 1969 -)

Research Assistants and Technicians

Robert C. Aylmer, Jr.
Susan Baldwin (October 1967 - March 1968)
Nancy Blackmun (summer 1966)
Christopher Davis (summer 1967)
Lawrence Dougherty (September 1967 - September 1968)
Gordon A. Dudley (resigned August 1967)
Patrick F. Ferrone (summer 1966)
Lynne Fitzhugh (resigned 1968)
Myra T. Gannaway
Charles E. Gunnoe
Thomas E. Hutchinson (appointed Research Associate, December 1968)
Diana J. Kronstadt (resigned July 1968)
Sheila Leahy
Priscilla A. Little
Sandra J. Morse (summer 1966)
Terence J. O'Mahoney (appointed Research Associate, December 1968)
Dana E. Quitslund (resigned December 1968)
Margaret E. Razar (resigned May 1968)
Charles Roehrig (May 1968 - September 1968)
Richard Roman
Susan Roman (resigned June 1969)
Stanley A. Schainker (resigned September 1967)
Johanna Seltzer (resigned June 1967)
Dorothy S. Swithenbank (resigned September 1968)
Thomas E. Swithenbank (resigned September 1968)
Elizabeth Truesdell
Jo Weissman (June 1968 - August 1968)
Esther Wiedman (resigned September 1968)
Charles S. Wetherell (resigned August 1967)

Laurence Wolff (resigned October 1967)
Patricia Yee
Barbara Zurer (resigned May 1967)

Communications Technician

Richard F. Topping

Secretaries

Patricia Capen (summer 1968)
Martha Drake
Dorothy Julia Emerson (resigned June 1968)
Karen Guillette (resigned September 1967)
Marietta Haley
Susan Hartman
Jacqueline Hargrove (resigned July 1967)
Nadia Hurt (resigned January 1967)
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Wendy Mahon (resigned 1968)
Felice A. Merritt (resigned September 1967)
Susan Morrison
Deborah Richardson
Wendy Simpson
Nona D. Strauss
Helen E. Topping

Clerks

Jayne Lyons (resigned June 1967)
Annette B. Miller (resigned June 1968)
Mary A. O'Doherty (resigned June 1967)

Keypunch Operator

Dorothy Boudreau (September 1968 -)

Couriers

James P. Dean (resigned June 1968)
Dennis Horger (September 1968 - June 1969)
Robert Sullivan (summer 1968 and 1969)

Consultants

Frank L. Field, University of California at Santa Barbara (July 1968)

Warren Gribbons, Regis College (summer 1965)
Chris D. Kehas, Claremont Graduate School (summer 1967)
Paul Lohnes, Project TALENT (summer and fall 1967)
Esther Matthews, University of Oregon (summer 1967)
Frank J. Minor (time contributed by IBM Corporation, Inc.)
Calvin Mooers, Rockford Research Institute, Inc. (summer and fall 1966)
George D. Pasquella, Film Consultant (May 1968)
Stanley Segal, Teachers College, Columbia University (summer 1967)

Sub-Contractors

Abt Associates (spring 1967)
Computer Associates (spring and summer 1967)

Visiting Researchers

Fran Archambault, University of Connecticut
Roy Forbes, General Learning Corporation
John McManus, University of Connecticut
William Mittlestadt, Eastman Kodak Co.
Gary Stapleford, Sanders Associates
Keith Whitmore, Eastman Kodak Co.

V. PUBLICATIONS

INFORMATION SYSTEM FOR VOCATIONAL DECISIONS (MODIFIED PROTOTYPE II)

(Sets of computer tapes containing all the ISVD programs and data bases are on file at the Library, The Center for Vocational and Technical Education, The Ohio State University, 1900 Kenny Road, Columbus, Ohio 43210 and the NESDEC Center for Educational Software Development, 55 Chapel Street, Newton, Massachusetts 02160. Sets of all ISVD documents are on file at the Library, The Center for Vocational and Technical Education, The Ohio State University and the Library, Harvard Graduate School of Education, Cambridge, Massachusetts 02138.)

REPORTS

First Annual Report, 1966-67
Second Annual Report, 1967-68
Third Report, 1968-70
Final Report, 1966-70

MANUSCRIPT

Thought, Choice, and Action: Processes of Exploration and Commitment in Career Development by Gordon A. Dudley and David V. Tiedeman

TECHNICAL MEMORANDA

1. "The Computer and Career Decisions" by Allan B. Ellis and Charles S. Wetherell
2. "Forecasting for Computer Aided Career Decisions: Survey of Methodology" by Russell G. Davis
3. "Level of Aspiration and Models Applicable to the Problem of Choice of Career" by Thomas E. Hutchinson
4. "Some Workforce Requirements Implied by Current Manpower Forecasts" by Laurence Wolff, Richard M. Durstine, and Christopher Davis

PROJECT REPORTS

1. "The Organization and Intention of a Proposed Data and Educational System for Vocational Decision-Making" by David V. Tiedeman
2. "An Information System for Vocational Decisions (ISVD): Cultivating the Possibility for Career through Operations" by David V. Tiedeman
3. "A Theoretical Foundation for the Use of Occupational Information in Guidance" by Robert P. O'Hara
4. "Suggestions for Treatment of Information about Occupations" by Richard M. Durstine
5. "Self Esteem Because of Collegiate Admission and Education" by David V. Tiedeman
6. "Forecasting for Computer-Aided Decisions: Prospects and Procedures" by Richard M. Durstine
7. "A Task Oriented Course in Decision-Making" by Eugene H. Wilson
8. "Toward a Language of Supervision" by Wallace J. Fletcher, Lawrence Lerer, and Charles Gunnoe

9. "Recent Developments and Current Prospects in Occupational Fact Mediation" by Gordon A. Dudley and David V. Tiedeman
10. "A Tentative Career Development Curriculum and its Implications for the Patterning of Supervisory Responsibilities in the Information System for Vocational Decisions" by Wallace J. Fletcher, Lawrence Lerer, and Charles Gunnoe
11. "A Rudimentary Demonstration for the Information System for Vocational Decisions: Orientation, Guidance Scripts, Test of Occupational Knowledge, and a Script Writing Language" by Allan B. Ellis, Robert P. O'Hara, and David V. Tiedeman
12. "The Role of Decision-Making in Information Generation: An Emerging New Potential in Guidance" by David V. Tiedeman
13. "Economic, Educational, and Personal Implications of Implementing Computerized Guidance Information Systems" by David V. Tiedeman
14. "Getting a Guidance Machine to Understand English" by Allan B. Ellis, Margaret E. Razar, and Patricia Yee
15. "Datafiles for Computerized Vocational Guidance: Requirements, Preparation, Use" by Richard M. Durstine

16a. "Can a Machine Develop a Career? A Statement about the Processes of Exploration and Commitment in Career Development" by David V. Tiedeman

16b. "The Information System for Vocational Decisions: Description, Subsequent Development, and Implications" by David V. Tiedeman

17. "Can a Machine Counsel?" by Allan B. Ellis and David V. Tiedeman
18. "The Cultivation of Careers through Guidance and Vocational Education" by David V. Tiedeman
19. "Can a Machine Admit an Applicant to Continuing Education" by David V. Tiedeman
20. "On the Concept of Purpose" by Frank L. Field
21. "A Quasi-Annotated Sourcelist for Occupational Forecasting" by Patricia Yee
22. "Mediating Student-Computer Interaction: Access Routines in an Interactive Guidance System" by Robert C. Aylmer, Jr.
23. "Description and Use of the Data Files on Military Careers" by Patricia Yee and Johanna Seltzer
24. "A Final Report on Forecasts and Datafiles Prepared for the Information System for Vocational Decisions by the Center for Studies in Education and Development" by Richard M. Durstine
25. "Implementation of a Career Decision Game on a Time Shared Computer: An Exploration of its Value in a Simulated Guidance Environment" by Richard A. Roman
26. "Developing and Implementing Materials for Computer Assisted Instruction" by Richard A. Roman
27. "Changing Perspectives in Education and Self-Correcting Thinking" by Myra T. Gannaway
28. "Final Report -- Computer-Assisted Systems in Guidance and Education: Report of an Invitational Conference on the Implications for the Practice and Education of Counselors" by Rhoda Baruch
29. "GLURP -- Generalized Language for Understanding and Responding to People" by Ann Taylor
30. "The Construction and Implementation of a Data Base" by Patricia Yee, Richard A. Roman, David K. Archibald, and Priscilla Little
31. "The Script Network: Present Conditions and Suggestions" by Richard A. Roman

32. "The Self Concepts Profiling Technique: A Procedure for the Exploration of Self Concept Systems" by Terence J. O'Mahoney
33. "Manual for GLURP: A Computer Assisted Instruction Language" by Richard A. Roman
34. "Program Description - HASM: Hierarchical Access Storage Management" by Heather Scott
35. "Program Description - DASM: Direct Access Storage Management" by David Brewster
36. "The Bigelow Junior High School Field Test" by Patricia Yee and Marjorie Madoff

APPENDIX I. THE ISVD PRODUCT

There are informal reports which have been written throughout the project. These might be assembled into a structure as follows:

Title: Systems Heuristics and Structures in the Facilitation of Career Comprehension

Part I. The Information System for Vocational Decisions Project

A. Proposal

Resource available: Proposal for an Information System for Vocational Decisions

B. Theory

Resources available: Gribbons and Tiedeman chart of Procedures for Implementing the Making of Vocational Decisions

Theory Section, Annual Report No. 1

"The Organization and Intention of a Proposed Data and Educational System for Vocational Decision-Making" by Tiedeman -- Project Report No. 1

"An Information System for Vocational Decisions (ISVD): Cultivating the Possibility for Career through Operations" by Tiedeman -- Project Report No. 2

"A Theoretical Foundation for the Use of Occupational Information in Guidance" by O'Hara -- Project Report No. 3

"Self Esteem Because of Collegiate Admission and Education" by Tiedeman -- Project Report No. 5

"The Role of Decision-Making in Information Generation: An Emerging New Potential in Guidance" by Tiedeman -- Project Report No. 12

Part II. Equipment Selection and Planning

Resource available: "The Computer and Career Decisions" by Ellis and Wetherell -- Technical Memorandum No. 1

Part III. Procedures for Heuristic and Strucuralizing Effects

A. Data

1. **Datafiles: concepts and scripts**

Resources available: "Description of the Tape of the Dictionary of Occupational Titles" by Wolff -- Working Paper

"User's Manual for Occupational Descriptions" by Wolff -- Working Paper

"Suggestions for Treatment of Information about Occupations" by Durstine -- Project Report No. 4

"Datafiles for Computerized Vocational Guidance: Requirements, Preparation, Use" by Durstine -- Project Report No. 15 and revision in Annual Report No. 2

"A Final Report on Forecasts and Datafiles prepared for the Information System for Vocational Decisions by The Center for Studies in Education and Development" by Durstine -- Project Report No. 24

2. **Decision: concepts and scripts**

Resources available: "A Tentative Classification System for the ISVD Scripts" by Aylmer, Kronstadt, McDade, and Wilson -- Working Paper

"You, the Decider" by Kronstadt and Wilson -- Working Paper

"A Task Oriented Course in Decision-Making" by Wilson -- Project Report No. 7

"Implementation of a Career Decision Game on a Time Shared Computer: An Exploration of its Value in a Simulated Guidance Environment" by Richard A. Roman -- Project Report No. 25

B. Process

1. **Articulating self and its scripts**

Resources available: "Self Development Processes: A Model and an Heuristic Procedure for Investigating Aspects of these Processes" by O'Mahoney - Doctoral Dissertation

"Levels of Aspiration and Models Applicable to the Problem of Choice of Career" by Hutchinson -- Technical Memorandum No. 3 augmented by Doctoral Dissertation

"The Strange Case of Dewey Webber III" by Hutchinson -- Working Paper

"The Self Concepts Profiling Technique: A Procedure for the Exploration of Self Concept Systems" by O'Mahoney -- Project Report No. 32

2. Articulating events and their scripts

   a. Forecasting and its scripts

      Resources available: "Forecasting for Computer Aided Career Decisions: Prospects and Procedures" by Durstine -- Project Report No. 6

      "Forecasting for Computer Aided Decisions: Survey of Methodology" by Davis -- Technical Memorandum No. 2

      "Some Workforce Requirements Implied by Current Manpower Forecasts" by Wolff, Durstine, and C. Davis -- Technical Memorandum No. 4

      "A Quasi-Annotated Sourcelist for Occupational Forecasting" by Yee and Seltzer -- Project Report No. 21

      "A Final Report on Forecasts and Datafiles prepared for the Information System for Vocational Decisions by the Center for Studies in Education and Development" by Durstine -- Project Report No. 24

   b. Games and scripts

      Resource available: "Implementation of a Career Decision Game on a Time Shared Computer: An Exploration of its Value in a Simulated Guidance Environment" by Roman -- Project Report No. 25

"System Analysis and Educational Simulation of the Machinist's Vocation" by Abt Associates

3. Articulating the epigenetic phenomenon in scripts of decision-making development

Resource available: "Language Usage in a Computer-Based Guidance System" by Aylmer -- Qualifying Paper

C. Action

1. College placement and its scripts

2. Job placement and its scripts

Resources available: "The Organization and Establishment, Through the Position of Coordinator, of a System-Wide Vocational Placement Service in the Newton, Massachusetts Public Schools" by Circle -- report of Doctoral Project

Reports on Follow-Up Studies at Newton by Clemens -- irregular reports plus report on his Doctoral Project

3. Career progress and its scripts

Resources available: "Career Profiles of Former Newton High School Students" by Circle

"Getting a Job: Writing and Using Resumes" by O'Mahoney -- Working Paper

Resource possible: Report by Wiedman on her work to an adult interview

Part IV. Systematization

A. Scripts and their organization

Resources available: MINORCA Manual by Roman

"Developing and Implementing Materials for Computer-Assisted Instruction" by Roman -- Project Report No. 26

"The Script Network: Present Conditions and Suggestions" by Roman -- Project Report No. 31

B. Organization and operation of the System

Resources available: "GLURP -- Generalized Language for Understanding and Responding to People" by Taylor -- Project Report No. 29

"Manual for GLURP: A Computer-Assisted Instruction Language" by Roman -- Project Report No. 33

"HASM: Hierarchical Access Storage Management" by Scott and Norris -- Project Report No. 34

"DASM: Direct Access Storage Management" by Brewster and Norris -- Project Report No. 35

Part V. Social dimension in comprehending epigenesis in career development

A. Career resources center

Resources available: "Career Information Service" by Circle, Clemens, Kroll, and Overholt -- published report

Work on jobs in education by Lerer

B. Career, education, and educators

1. Vocational education in Newton

Resources available: "The Cooperative Work-Study Program, Newton, Massachusetts Public Schools: Survey and Analysis" by Lerer and Gunnoe -- Working Paper

"Toward a Language of Supervision" by Fletcher, Lerer, and Gunnoe -- Project Report No. 8

"A Tentative Career Development Curriculum and Its Implications for the Patterning of Supervisory Responsibilities in the Information System for Vocational Decisions" by Fletcher, Lerer, and Gunnoe -- Project Report No. 10

2. Opportunity centers

Resource possible: Report by Lerer on curriculum used in a job corps center

3. Counselor education

Resources available: Comments by Tiedeman's students on Man, Machine, and Career in Elementary Perspective

Report by Archibald on Institute for Counselors and Programmers from Milwaukee, Springfield, Mass., and Waco

"Computer-Assisted Systems in Guidance and Education: Report of an Invitational Conference on the Implications for the Practice and Education of Counselors" by Rhoda Baruch -- Project Report No. 28

C. Career, industry, and government

Resources available: "Prospects for Technology and Commerce in the Mediation of Vocational Development for Vocational Maturity" by Tiedeman and Dudley -- Project Report No. 9

"Economic, Educational, and Personal Implications of Implementing Computerized Guidance Information Systems" by Tiedeman -- Project Report No. 13

"Business, Government, and University in the Generation of Computer-Based Guidance Systems" by Baruch, Boyan, and Ellis -- Project Report No. 38

"The Process of Decision Concerning Entry into the Field of Education: A Study of Education-Industry Interaction" by Richard Carle -- Doctoral Dissertation

"The Implementation and Evaluation of a Computer-Based Career Information System" by W. King Gillen -- Doctoral Dissertation

Part VI. Formative evaluations

A. Experiments with systems

Resource possible: Report by Archibald of 1966 summer work with ELIZA

B. First demonstration

Resource available: "A Rudimentary Demonstration for the Information System for Vocational Decisions: Orientation, Guidance Scripts, Test of Occupational Knowledge, and a Script Writing Language" by Ellis, O'Hara, and Tiedeman -- Project Report No. 11

C. Operating prototype and its formative evaluation

Resource available: Report by Yee on field test

Part VII. Can a machine educate? Overviews

A. Getting a machine to evaluate

Resources available: "The Computer and Testing" by Socarides -- HBW Conference

"The Organization of Select" by Lovell -- HBW Conference

"The Development and Organization of a System to Evaluate Student Learning" by Madaus -- HBW Conference

"Can a Machine Evaluate?" by Ginther -- HBW Conference

"The Use of Machines in Formative Evaluation" by Airasian -- HBW Conference

B. Getting a machine to understand English

Resource available: "Getting Machine to Understand English?" by Ellis, Pincus, and Yee -- Project Report No. 14 and Annual Report No. 2

C. Getting a person and a machine to improve in understanding

Resources available: "Can a Machine Develop a Career? A Statement about the Processes of Exploration and Commitment in Career Development" by Tiedeman -- Project Report No. 16a and Third Report

"Can a Machine Cultivate Career Development?" by Cahill, Griffin, O'Hara, and Paterna -- HBW Conference

"Can a Machine Admit and Applicant to Continuing Education?" by Tiedeman -- Project Report No. 19 and Third Report

"Can a Machine Counsel?" by Ellis and Tiedeman -- Project Report No. 17 and Third Report

"An Investigation of the Question: Can a Machine Teach?" by Williamson -- HBW Conference

D. Getting a machine at all

Resources available: "The Information System for Vocational Decisions: Description, Subsequent Development, and Implications" by Tiedeman -- Project Report No. 16b

"Guidance and Psychology in the 1980 Secondary Education of Adolescents and Young Adults" by Tiedeman — Working Paper

Proposal with TERC by Cadle, Ellis, Nelson, O'Hara, Sununu, and Tiedeman

In addition to the above, the project has also given rise to the following publications and manuscripts accepted for publication:

I. Articulatory Statements

Invitational Conference on Systems Under Development for Vocational Guidance

1. A Report of a Research Exchange Conference, 18-19 August 1966. Columbus, Ohio: The Center for Vocational and Technical Education, The Ohio State University.
2. Santa Monica, California: Systems Development Corporation, 1967. (unpublished)
3. Third Symposium, 14-15 September 1967. Yorktown Heights, New York: IBM Advanced Systems Development Division.
4. Palo Alto, California: American Institutes for Research, 1968. (unpublished)
5. Business, Government, and University in the Generation of Computer-Based Guidance Systems, 11-12 October 1968. Cambridge, Mass.: The Information System for Vocational Decisions, Harvard University, Graduate School of Education. (in preparation)

II. Books

1. Dudley, Gordon A.; and Tiedeman, David V. (eds.) *Thought, Choice, and Action: Processes of Exploration and Commitment in Career Development*. Homewood, Illinois: The Dorsey Press (in press)
2. Tiedeman, David V.; and Wiedman, Esther. (eds.) *Guidance and the Maturing Individual*. New York: Macmillan (in press)

III. Other Publications

1. Ellis, Allan B.; and Tiedeman, David V. "Can a Machine Counsel?" in *Computer-Assisted Instruction, Testing, and Guidance*. Wayne Holtzman (ed.) New York: Harper and Row (in press)
2. O'Hara, Robert P.; and Tiedeman, David V. "Occupational Facts and Their Use: Mediation and the Generation of Occupational Information" in *Vocational and Technical Education Today*. J. Kenneth Little and Gerald G. Somers (eds.) Madison, Wisconsin: Center for Studies in Vocational and Technical Education, University of Wisconsin (in press)
3. Tiedeman, David V.; and Dudley, Gordon A. "Recent Developments and Current Prospects in Occupational Fact Mediation." in *Implications of Career Development Theory and Research for Counselor Education*. Roger A. Myers (ed.) New York: Teachers College, Columbia University, 1967. pp. 34-85.

4. Tiedeman, David V.; and Morley, Eileen. "Guidance and Vocational Competence: A Theory for Ideal Practice." in *Guidance in Vocational Education: Guidelines for Research and Practice.* Robert E. Campbell (ed.) Columbus, Ohio: Center for Vocational and Technical Education, The Ohio State University, 1966. pp. 91-96
5. Tiedeman, David V. "Can a Machine Develop a Career? A Statement About the Processes of Exploration and Commitment in Career Development" and "The Information System for Vocational Decisions: Description, Subsequent Development, and Implications" in *Perspectives on Vocational Development.* John M. Whiteley (ed.) St. Louis, Missouri: Washington University (in press)
6. Tiedeman, David V. "Information Generation: From Data Retrieval to the ISVD." *CAPS Capsule.* 1, No. 3, 1968, pp. 1ff.
7. Tiedeman, David V. "The Role of Decision-Making in Information Generation: An Emerging New Potential in Guidance." *Newera.* 49, 8, September-October 1968. pp. 224-229
8. Tiedeman, David V. "Comprehending Epigenesis in Decision-Making Development." in *Computer-Assisted Counseling.* Donald E. Super (ed.) New York: Teachers College, Columbia University (in press)
9. Tiedeman, David V. "Career, Decision-Making, and Information Generation: A Tale of Vocational Education and Feedforward." in *1968 Yearbook of the Trade and Industrial Education Division.* Von H. Robertson (ed.) American Vocational Association

APPENDIX II. DOCUMENTATION OF THE ISVD DATAFILES

The documentation of the ISVD datafiles is organized in the following manner:

Occupation Data Base

1. **Cover Sheet**
2. **Merged File Codes (coding format)**
3. **Merged File Descriptor Names**
4. **Order of Occupational Decode Tables**
5. **Merged File -- Names of Decode Tables**
6. **Lists (decode tables -- includes job titles)**
7. **Level 1 Record Names -- Preference Script**
8. **Level 1 Recrod Specifications for Preference Script**
9. **Name of Sentences (Descriptors used in Occ. Sentences)**
10. **Names of Sentence Records**
11. **Sentence Records**
12. **Level 1 Record Names and Specifications (O'Hara's D.O.T. Script)**
13. **Code Book for Occupation Descriptions**
14. **Script Names**
15. **Flow Chart of Scripts**

Education Data Base

College File

1. **Codes (coding format)**
2. **Descriptor Names**
3. **Names of Decode Tables**
4. **Lists (decode tables -- includes college names)**
5. **Level 1 Record Names -- Preference Script**
6. **Level 1 Record Specifications for Preference Script**
7. **Names of Sentence Records**
8. **Sentence Records**
9. **Flow Chart of Scripts**

Trade School File

1. **Coding Format**
2. **Descriptor Names**
3. **Names of Decode Tables**
4. **Lists (decode tables -- includes school names)**
5. **Level 1 Record Names -- Preference Script**
6. **Level 1 Record Specifications for Preference Script**
7. **Sentence Records**
8. **Flow Chart of Scripts**

Military Data Base

1. **Field Names -- Level 0 Records -- Descriptor Names**

2. Army File (coding format)
3. Navy File (coding format)
4. Air Force File (coding format)
5. Names of Decode Tables
6. Lists (decode tables -- includes job titles)
7. Army, Navy, and Air Force Names of Sentence Records
8. Sentence Records
9. Level 1 Record Names -- Preference Script
10. Level 1 Record Specifications for Preference Script
11. Flow Chart of Scripts

Inq Table File

This file includes the Newton Student Records (Inquirer Characteristics File) as well as script records and miscellaneous tables.

Newton Student Records

1. Nick Files (coding format)
2. Nick Files Descriptor Names
3. Inq Table Decode Lists
4. Nick Files (decode lists)

Script Records and Miscellaneous Tables

1. Decode Tables -- Lists 13 and 14 (listing of all scripts by real names and short names)
2. Decode Table -- List 15 (scripts)
3. Flow Chart of System Scripts
4. Decode Table -- Colfact -- List 16
5. Decode Table -- Occfact -- List 17
6. Decode Table -- Trafact -- List 18
7. Decode Table -- Milfact -- List 19
8. Decode Table -- Data Base -- List 20
9. Decode Table -- IOERR -- List 21
10. Inq Table -- Names of Level 1 Records of Scripts
11. Inq Table -- Specifications for Level 1 Records

Newton Students Follow-Up File

1. Coding Format

HGSE Placement Data Base

1. Coding Format
2. Descriptor Names
3. Names of Decode Tables
4. Lists (includes Employer Names and Codes)
5. Assignment of Record Numbers
6. Level 1 Record Names

7. Level 1 Record Specifications for Preference Script

In addition, explanatory test is included for the Occupation, Trade School, and Inquirer Characteristics (Newton Student Records) files. The high school and junior high school reports are not included in the documentation of the Education Data Base since the grade level descriptions are presented in the form of scripts rather than as templates. Further information about the Occupation, Education, Military, and system script network is presented in Project Report No. 31.

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